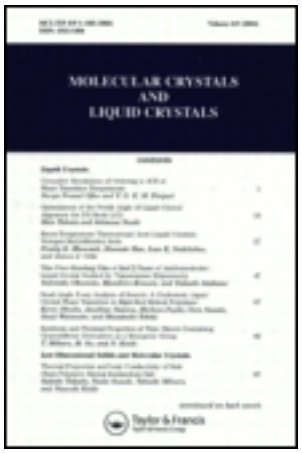

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Spectroscopy of Molecular Crystals: A Bibliography for 1969

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Spectroscopy of Molecular Crystals: A Bibliography for 1969

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Contents

1. Introduction

This Bibliography is a continuation of the well-known and widely used series of Bibliographies " Energy Transfer in Polyacene Solid Solutions " edited by Dr. F. Lipsett during 1957–1969. The full list

of these issues is in *Molecular Crystals and Liquid Crystals*, **6**, 175, 1969. The 1969 Bibliography is made up on the basis of the long-standing bibliography work carried out in the Institute of Solid State Physics in Chernogolovka.

The title of the 1969 Bibliography, the section headings and the distribution of the material are changed in comparison with the previous issues, but the overall format is retained.

Section 2 is traditional. While systematizing the molecule spectroscopy material in free, condensed, and crystal states, we thought it reasonable to subdivide that material into three sections: one dealing with the molecular aspect of spectroscopy (Sec. 3), and the other two (Secs. 5 and 6) containing exciton ideas on crystal spectra as well.

A clear cut realm of phenomena is connected with intermolecular complexes. The complex properties are closely related both to the free molecule and the crystal properties. The material on these complexes is presented in Sec. 4.

Theoretical aspects of excited states and spectroscopy of molecular crystals are presented in Sec. 7. Section 8 is devoted to photoelectric properties.

Three new sections (9, 10, 11) no present in previous issues are introduced in the Bibliography. Section 9 consists of the 1968–1969 papers on exciton properties at high concentration. For the time being, this realm of investigation is an independent field. This field is rapidly developing and displays new aspects of the collective interaction problem. This problem is common for all kinds of crystal, which is why we included in this section the data on investigation of semiconductor crystal in addition to the molecular crystal data.

Section 10 presents the 1968–1969 papers on spectroscopy of antiferromagnet crystals. In such crystals as in the case of molecular ones, excited electronic states are described in the terms of small radius excitons. The specific properties of antiferromagnet crystals are associated with spin-spin and electron-spin interaction, but the latter is very similar to that of electron-vibration in molecular crystals. As a result, the two kinds of crystals have much in common.

Section 11 presents the information obtained from applying the

excition ideas to various systems which are neither molecular nor semiconductor crystals.

In comparison with the previous issues, Sec. 13, dealing with various experimental technique questions, is made somewhat shorter.

The references in each section are listed in alphabetical order of authors, and the language is indicated following the year. Where possible, references to Chemical Abstracts and Physical Abstracts are given. The translation of Russian papers is made according to Chemical Titles and partially to Physics Abstracts. In the near future, it is hoped to edit the Bibliography for 1970.

The editor is very grateful to Dr. F. Lipsett who has set a beautiful example of scientific bibliography work and who stimulated its development in the Institute of Solid State Physics of the Academy of Sciences of the U.S.S.R.

2. Books and Reports of Meetings

AGRANOVICH, V. M. *Exciton theory*, Moscow, Nauka (1968) (Russ).
AUSTIN, I. G. and MOTT, N. F., "*Polarons in crystalline and non-crystalline materials*," Adv. Phys." **18**, N 71, 41-102 (1969) (Eng).
BALDWIN, G. C., *Nonlinear optics, An introduction to*, New York, Plenum (1969) (Eng) (*P.A.* **70**: 26588).
BOBOVICH, Y. S., "Resent progress in the spectroscopy of spontaneous Raman scattering," *Usp. Fis. Nauk* **97**, N 1, 37–76 (1969) (Russ).
BOLSHAKOV, G. F., *et al.*, *Ultraviolet spectra of heteroorganic compounds*, Leningrad, Khimia (1969) (Russ).
BORTOLANI, V. and CALANDRA, C., " Transporto di cariche ed energia in cristalli organici," *Atti Semin. mat. e fis. Univ. Modena*, N 18, 109-43 (1969) (Italy).
BOUSQUET, P., *Spectroscopie instrumentale*, Paris, Dunod (1969) (Fr).
BURNETT, G. M. and NORTH, A. M., Ed., *Transfer and storage of energy by molecules. Vol. I. Electronic energy*, London-New York-Sydney-Toronto, Wiley-Interscience (1969) (Eng).
DAVIES, D. W., *The theory of the electric and magnetic properties of molecules*, New York, Wiley (1967) (Eng).
DAVYDOV, A. S., *Molecular exciton theory*, Moscow, Nauka (1968) (Russ).
DI BARTOLO, B., *Optical interactions in solids*, New York, Wiley (1968) (Eng).
DIENES, G. J., LABES, M. M. and BROWN, G. H., Ed., Liquid crystal conference. Proceedings of the Second International Liquid Crystal Conference, Kent State University, August 12–16, 1968, *Mol. Cryst. and Liq. Cryst.* **7**, 1–468 (1969) (Eng).
EREMENKO, V. V. and BELYAEVA, A. I., " Light absorption in anti-ferro magnetic dielectrics," *Usp. Fiz. Nauk* **98**, N 1, 27–70 (1969) (Russ).
ERSHOV, U. A., KUZINA, S. I. and NEIMAN, M. B., " Mechanism of light aging and stabilization of polymers," *Usp. Khim.* **38**, N 2, 289–320 (1969) (Russ).
FOSTER, R., *Organic charge transfer complexes*, New York, Academic press (1969) (Eng).
GRISWOLD, E. *Chemical bonding and structure*, S.l., Raytheon, cop. IV. 124 p. ill. (Topics in modern chemistry) (1968) (Eng).
HEDVALL, J. A., *On the Chemistry of solids, some present and future applications*, Göteborg (1969).
HENDRA, P. J. and STRATTON, P. M., " Laser-Raman spectroscopy," *Chem. Rev.* **69**, N 3, 325–44 (1969) (Eng).
HEPPLE, P., Ed., *Molecular spectroscopy*, Proceedings of a Conference held at Brighton, England (17–19 Apr. 1968) (Eng).
JONES, W. J., " Lasers," *Quarterly Rev.* **23**, N 1, 73–97 (1969) (Eng).
JORGENSEN, C. K., NEILANDS, J. B., NYHOLM, R. S., REINEN, D. and WILLIAMS, R. J., *Structure and bonding. Vol.* 5. Berlin-Heidelberg-New York, Springer (1968) (Eng).
KHOLMOGOROV, V. E., " Electron paramagnetic resonance method for studying the photo transfer of an electron and sensitized photochemical reactions," *Usp. Khim.* **38**, N 2, 321–50 (1969) (Russ).
KOCK, Y. E., *Lasers and holography. Introduction to Coherent optics*, New York, Anchar Books (1969) (Eng).
LECTURES on elementary excitations and their interactions in solids. 11–23 Jul 1966. Sponsors: NATO. Cortina d'Ampezzo (1968) (Eng) (*P.A.* **70**: 1807).
LIPSON, S. G. and LIPSON, H., *Optical physics*, London, UK, Cambridge University Press (1969) (Eng). (*P.A.* **69**: 40227).
LITTLE, L. H., *Infrared spectra of adsorbed species*, London and New York, Academic Press (1966) (Eng).

LÖWDIN, P. O., Ed., Proceedings of the International Symposium on Atomic, Molecular, and Solid State Theory and Quantum Biology. Held at Sanibel Island, Florida, January 13–18, 1969. *Int. J. Quantum Chem.*, Symposium N 3, Pt. 1 (Eng).
LÖDWIN, P. O., Ed., " Proceedings of the International Symposium on Atomic, Molecular, and Solid-State Theory and Quantum Biology." Held at Sanibel Island, Florida, January 13–18, (1969). 349–991. *International J. Quantum Chem.*, Symposium N 3. Part 2.
LUIS, JOSÉ and AMOROS, MARISA. *Molecular crystals; their transforms and diffuse scattering.* New York [a.o.], (cop. 1968), Wiley XV, 479 pp., ill.
MAYSTER, T. G., *Polyatomic molecules electronic spectra.* Leningrad (1969), 206 pp. (Russ).
MCGLYNN, S. P., AZUMI, T. and KONOSHITA, M., *Molecular spectroscopy of the triplet state,* Englewood-Cliffs, New Jersey, Prentice-Hall, 1969, XIv, 434. (Prentice-Hall internat. ser. in chemistry). 16.95.-
Science **164**, N 3876, 223. (1969) (Eng).
LIM, E. C., Ed., *Molecular luminescence,* New York, Benjamin, (1969) 910 pp.
MOONEY, E. F., Ed., *Annual review of NMR spectroscopy* **1**, Academic Press, London and New York (1968) (Eng).
MURRELL, J. N., KETTLE, S. F. and TEDDER, J. M., *Valence theory,* London a.o., (1969) XIII. 401 pp., ill.
NURMUKHAMETOV, R. N., Spectroscopy of polyhydric molecules by the Spol'sky method. " Usp. Khim." **38**, 351–75 (1969) (Russ).
NUDELMAN, S. and MITRA, S. S., Ed., *Optical properties of solids.* Proc. of a NATO International Advances Study Institute held at the University of Freiburg West Germany, August 7–20 (1966) N.Y. Plenum Press (1968) 640 pp.
ORSZAG, A., *Les lasers. Principles, realisation applications,* Paris, Mason (1968) (Fr).
PERRY, E. S., Ed., *Progress in separation and purification* 1, New York, Wiley (1968) (Eng).
REBANE, K. K., *Simple theory of the vibrational structure of the impurity centre crystal spectra,* Moscow, Nauka (1968) (Russ).
RIEHL, N. and KALLMAN, H., Ed., *International symposium on luminescence,* Munich. The physics and chemistry of scintillators, München, Thiemig (1968) (Eng).
SHEKA, E. F., *Electronic-vibrational spectra of molecules and crystals,* Preprint of the Institute of Solid State Physics, Moscow, (1969) (Russ).
STAROSTIN, N. V. and FEOFILOV, P. P., " Magnetic circular anisotropy in crystals," *Usp. Fis. Nauk* **97**, N 4, 621–55 (1969) (Russ).
SUSHCHINSKI, M. M., *Raman scattering spectra of molecules and crystals,* Moscow, Nauka (1969) (Russ).
SYMPOSIUM on molecular wave functions, London, 12th-13th Dec. 1968, *Sympos. Faraday Soc.* N 2, 3–106. (1968) (Eng).
THYAGARAJAN, S., Ed., *Mechanisms of molecular migrations,* New York, Wiley (1968) (Eng).
THE TRIPLET STATE. Proceedings of an International Symposium held at the Department of Physics, American University of Beirut, Lebanon, 14–19 February 1967. A. B. Zahlan, Chairman Editorial Board, Cambridge University Press, 1967, *J. Opt. Soc. Amer.* **58**, N 592 (1968) (Eng).
VARSÁNYI, G., *Vibrational spectra of benzene derivations,* Budapest, Akademiai Kiado (1969) (Eng).
WALLIS, R. F., Ed., *Localized excitations in solids,* Proc. of the First International Conference on Localized excitation in Solids, held September 18–22, 1967, at the Univ. of California at Irvine. New York, Washington, London, Plenum Press (1968) (Eng).
WENDLANDT, W. W., *Modern aspects of reflectance spectroscopy,* New York, Plenum Press (1969) (Eng).
ZAHLAN, A. B., Ed., *Excitons, magnons and phonons* in *molecular crystals.* Proceedings of an International symposium held at the Physics dep. of the American Univ. of Beirut, Lebanon, 15–18 Jan., 1968, Cambridge Univ. Press (1968) (Eng).
ZAKHARCHENYA, B. P. and SEISYAN, R. P., " Diamagnetic excitons in semiconductors," *Usp. Fiz. Nauk* **97**, 70–9 (1969) (Russ).
ZIMAN, J. M., " Solid State," *Phys. Today* **21**(5), 53 (1968) (Eng).
ZORKIY, P. M., *Architecture of crystals,* Moscow, Nauka (1968) (Russ).

3. Spectra of Aromatic Molecules in Gaseous and Condensed States

3.1. Electronic States

AMOS, A. T. and MUSHER, J. I., " A comment on the application of Hartree-Fock perturbation theory to pi-electron systems," *Mol. Phys.* **13**, N 6, 509–15 (1968) (Eng).
AMOS, A. T. and ROBERTS, H. G. Ff., " A modified Hückel method for calculating ring current contributions to the diamagnetic susceptibilities of conjugated hydrocarbons," *Theor. Chim. Acta* **13**, N 5, 421–7 (1969) (Eng).
BABA, H., SUZUKI S. and TAKEMURA, T., " Configuration analysis in the LCAO molecular orbital theory," *J. Chem. Phys.* **50**, N 5, 2078–86 (1969) (Eng).
BAILEY, M. L., " Semi-empirical π-electron calculations," *Theor. Chim. Acta* **13**, N 1, 56–64 (1969), (Eng).
BARD, A. J., SANTHANAM, K. S. V., MALOY, J. T., PHELPS, J. and WHEELER, L. O., " Steric effects and the electrochemistry of phenyl-substituted anthracene and related compounds," *Disc. Faraday Soc.*, N 45, 167–74 (1968) (Eng).
BASILEVSKY, M. V., " Some new aspects of π-electron theory," *Theor. Chim. Acta* **13**, N 5, 409–20 (1969) (Eng).
BERSUKER, I. B., " Dipole moments of symmetrical molecular systems," *Teor. Eksp. Khim.* **5**, N 3, 293–299 (1969) (Russ).
BESSIS, G., ESPAGNET, P. and BRATOŽ, S., " Theory of biorbitals. Study of conjugated systems in their ground and excited electronic states," *Int. J. Quantum Chem.* **3**, N 2, 205–18 (1969) (Eng).
BIRKS, J. B., " Assignment of two electronic states of benzene," *Chem. Phys. Letters* **3**, N 8, 567–8 (1969) (Eng).
BOCK, H. und ALT, H., " *d*-Orbitaleffekte in Silicium-substituierten π-Elektronensystemen, XVI. Si←O-Wechselwirkungen in Siloxynaphthalinen," *Chem. Ber.* **102**, Hf. 5, 1534–41 (1969) (Ger).
BOLOTNIKOVA, T. N., MALKES, L. Y., NAZARENKO, A. I. and YAKOVENKO, V. N., " Effect of halogens on

the pi-electron system of stilbene," *Optics and Spectrosc.* **26**, N 2, 315–16 (1969) (Russ).
BORISOVA, N. P. and GAVRILOV, V. G., " Use of Pople-Santry-Segal method for benzene molecule calculations," *Teor. Eksp. Khim.* **5**, N 5, 673–6 (1969) (Russ).
BOWERS, K. W., " Orbital degeneracy in benzene and substituent effects," In: *Radical Ions*, New York-London-Sydney 211–44 (1968) (Eng).
BUENKER, R. J. and PEYERIMHOFF, S. D., " Ab initio SCF calculations for azulene and naphthalene," *Chem. Phys. Letters* **3**, N 1, 37–42 (1969) (Eng).
BUENKER, R. J., WHITTEN, J. L. and PETKE, J. D., " Ab initio SCF MO and CI calculations on the electronic spectrum of benzene," *J. Chem. Phys.* **49**, N 5, 2261–7 (1968) (Eng) (*C.A.* **69**: 101163 k).
BURNELLE, L. and KRANEPOOL, M. J., " Electronic structure and ionization potential of several aromatic derivatives," *J. Mol. Structure* **2**, N 4, 331–5 (1968).
BYKOV, G. V., " Dipole moments of bonds in organic compounds," *Zh. Fis. Khim.* **43**, N 3, 568–73 (1969) (Russ).
CHALVET, O. et LEIBOVICI, C. " Etude théorique de dérivés substitués du benzène. III. Les fluorobenzènes," *Theor. Chim. Acta* **13**, N 4, 297–307 (1969) (Fr).
CLARKE, R. H. and HOCHSTRASSER, R. M., " Location and assignment of the lowest triplet state of perylene," *J. Mol. Spectrosc.* **32**, N 2, 309–19 (1969) (Eng).
CLEMENTI, E., " Electronic structure in aromatic compounds," *Chem. Rev.* **68**, N 3, 341–73 (1968) (Eng).
COHEN, A. and DESCHAMPS, J., " 1,4-naphthacene quinone studied by the Huckel method. Comparison with the first experimental results," *Tetrahedron Letters*, N 42, 4409–13 (1968) (Fr).
DANILOVA, V. I. and BELOMYTSEV, S. Y., " Spectra, mutual atom effects, and excited state properties of molecules. Ketones, aldehydes, carboxylic acids, and amides of acids of aliphatic and aromatic series," *Izv. Vyssh. Ucheb. Zaved., Fis.*, N 8, 134–7 (1969) (Russ).
DEWAR, M. J. S. and DE LLANO, C., " Ground states of conjugated molecules. XI. Improved treatment of hydrocarbons," *J. Amer. Chem. Soc.* **91**, N 4, 789–95 (1969) (Eng).
DEWAR, M. J. S. and MORITA, T., " Ground states of conjugated molecules. XII. Improved calculations for compounds containing nitrogen or oxygen," *J. Amer. Chem. Soc.* **91**, N 4, 796–802 (1969) (Eng).
DEWAR, M. J. S. and MORITA, T., " Ground states of conjugated molecules. XIII. Basicities of conjugated carbonyl compounds," *J. Amer. Chem. Soc.* **91**, N 4, 802–7 (1969) (Eng).
DINER, S., MALRIEU, J. P. and CLAVERIE, P., " Localized bond orbitals and the correlation problem. I. The perturbation calculation of the ground state energy," *Theor. Chim. Acta* **13**, N 1, 1–17 (1969) (Eng).
DOGGETT, G., " Atomic valence states in molecular orbital theory," *Theor. Chim. Acta* **15**, N 4, 344–52 (1969) (Eng).
DONCKT, E. V. and PORTER, G., " Acidity constants of anthracene derivatives in singlet and triplet excited states," *Trans. Faraday Soc.* **64**, N 552, Pt. 12, 3218–23 (1968) (Eng).
FAVINI, G., GAMBA, A. and SIMONETTA, M., Interpretation of electronic spectra of aromatic hydrocarbons by the " Molecules in molecules" method, *Theor. Chim. Acta* **13**, N 3, 175–94 (1969) (Eng).
FIGGINS, R. and RHODES, M., " Molecular reorientation in chlorobenzene," *Mol. Phys.* **17**, N 6, 669–71 (1969) (Eng).
GAMBA, A., " Applicazioni particolari del metodo ' Molecole in molecole ': lo spettro elettronico del trifenilene," *Rend. Ist. lombardo. Accad. Sci. e lettere* **102A**, N 3, 538–46 (1968) (Ital).
GRISWOLD, E., *Chemical bonding and structure*. S. I., Raytheon, cop. (1968) (Eng).
HEGYI, M. G., MEZEI, M. and SZONDY, T., " Determination of molecular properties by the method of moments, I," *Theor. Chim. Acta* **15**, N 4, 273–82 (1969) (Eng).
HEGYI, M. G., MEZEI, M. and SZONDY, T., " Determination of molecular properties by the method of moments, II," *Theor. Chim. Acta* **15**, N 4, 283–92 (1969) (Eng).
HIRST. D. M. and MACKEY, P. H., " Non-paired spatial orbitals wave functions for naphthalene," *Chem. Phys. Letters* **3**, N 4, 255–6 (1969) (Eng).
HOCHSTRASSER, R. M. and NOE, L. J., " Dipole moments of the excited states of azulene," *J. Chem. Phys.* **50**, N 4, 1684–8 (1969) (Eng) (*P.A.* **69**: 30075).
HOCHSTRASSER, R. M. and MARZZACCO, C., " Perturbations between electronic states in aromatic and heteroaromatic molecules," *J. Chem. Phys.* **49**, N 3, 971–84 (1968) (Eng) (*C.A.* **69**: 91490y).
IOGANSEN, L. V., " Theory of the electron structure of cyclic molecules," *Dokl. Akad. Nauk SSSR* **189**, N 2, 281–3 (1969) (Russ).
JONES, A. J., " Criteria for aromatic character," *Rev. Pure Appl. Chem.* **18**, Dec., 253–80 (1968) (Eng).
KARLSSON, G. and MÅRTENSSON, O., " Charge influence in semi-empirical calculations of heteroatomic ionic and neutral molecules," *Theor. Chim. Acta* **13**, N 3, 195–212 (1969) (Eng).
KARWOWSKI, J., " Effect of doubly excited configurations on the locations of electronic states in benzene," *Bull. Acad. Pol. Sci., Ser. Sci., Math., Astron. Phys.* **16**, N 2, 141–7 (1968) (Eng) (*C.A.* **68**: 111509).
KELLY, H. P., " Many-body perturbations theory applied to molecules," *Phys. Rev. Letters* **23**, N 9, 455–7 (1969) (Eng).
KHETRAPAL, C. L. and RAI, D. K., " Pariser-Parr-Pople type SCF-MO-CI calculations on pentafluorobenzenes," *Theor. Chim. Acta* **13**, N 4, 308–12 (1969) (Eng).
KITAIGORODSKY, A. I. and DASHEVSKY, V. G., " Conformational analysis of overcrowded aromatic molecules," *Tetrahedron* **24**, N 18, 5917–28 (1968) (Eng).
KUDCHADKER, A. P., ALANI, G. H. and ZWOLINSKI, B. J., " The critical constants of organic substances," *Chem. Rev.* **68**, N 6, 659–755 (1968) (Eng).
KWIATKOWSKI, J. S., " Electronic structure and spectra of organic molecules. Part IV. The Pariser-Parr-Pople type calculations for purine and some of its 6-substituted derivatives," *Theor. Chim. Acta* **10**, N 1, 47–64 (1968) (Eng).
LEIBOVICI, C., " Theoretical study of substituted benzenes. Monoalkoxybenzenes," *Theor. Chim. Acta* **12**, N 1, 34–47 (1968) (Fr).
LEIBOVICI, C., " Theoretical study of substituted benzenes. Symmetrical dialkoxybenzenes," *Theor. Chim. Acta* **12**, N 1, 48–56 (1968) (Fr).
LEIBOVICI, C., " Theoretical study of the electronic spectrum of fluorobenzene," *C.R. Acad. Sci. Paris* **267c**, N 18, 1121–2 (1968) (Fr).
LINDERBERG, J. and THULSTRUP, E. W., " Elementary excitations in a benzene model," *J. Chem. Phys.* **49**, N 2, 710–15 (1968) (Eng) (*P.A.* **69**: 804).
MARLIEN, J. P., CLAVERIE, P. and DINER, S., " Localized bond orbitals and the correlation problem. II. Application to π-electron systems," *Theor. Chim. Acta* **13**, N 1. 18–45 (1969) (Eng).

MATAGA, N. and TANIMOTO, O., " Possible mechanisms of intermolecular charge transfer and electron transfer processes in the excited electronic state," *Theor. Chim. Acta* **15**, N 2, 111–22 (1969) (Eng).
MAYSTER, T. G., *Polyatomic molecules electronic spectra*, Leningrad (1969) (Russ).
MCHUGH, A. J. and GOUTERMAN, M., " Oscillator strengths for electronic spectra of conjugated molecules from transition gradients. III. Polyacenes," *Theor. Chim. Acta* **13**, N 3, 249–58 (1969) (Eng).
MOMIGNY, J. and LORQUET, J. C., " On the position of electronic states of the C_6H_6 and $C_6H_5F^+$ ions,', *Chem. Phys. Letters* **1**, N 10, 455–6 (1968) (Eng) (*P.A.* **68**: 12257).
MORTENSEN, O. S., " Determination of electronic symmetries from polarized Raman spectra," *Chem. Phys. Letters* **3**, N 1, 4–5 (1969) (Eng).
MULLIKEN, R. S., " The Rydberg states of molecules," *J. Amer. Chem. Soc.* **91**, N 17, 4615–21 (1969) (Eng).
NAKAJIMA, T. and TOYOTA, A., " The ground-state geometries and symmetries of some non-alternant conjugated hydrocarbons," *Chem. Phys. Letters* **3**, N 5, 272–4 (1969) (Eng) (*P.A.* **69**: 872).
NAKHIMOVSKAYA, L. A., " Conditions for the realization of the Spol'sky effect." *Optics and Spectrosc* **24**, N 2, 207–10 (1968) (Russ) (*P.A.* **69**: 1802).
NAKHIMOVSKAYA, L. A., " Nature of the Spol'sky effect," *Izv. Akad. Nauk SSSR, Ser. Fiz.* **32**, N 9, 1521–4 (1968) (Russ).
NOWAKOWSKI, J., " Anisotropy of diamagnetic susceptibility of alternant hydrocarbons," *Theor. Chim. Acta* **10**, N 1, 79–85 (1968) (Eng).
NYGAARD, L., BOJESEN, I., PEDERSEN, T. and RASTRUP-ANDERSEN, J., " Structure of fluorobenzene," *J. Mol. Structure* **2**, N 3, 209–15 (1968) (Eng).
PLOTNIKOV, V. G., " Electron states of molecules and their photochemical decomposition in the condensed phase. Decomposition of hydrocarbons on radicals," *Optics and Spectrosc.* **27**, N 4, 593–600 (1969) (Russ).
POPLE, J. A., BEVERIDGE, D. L. and DOBOSH, P. A., " Molecular orbital theory of the electronic structure of organic compounds. II. Spin densities in paramagnetic species," *J. Amer. Chem. Soc.* **90**, N 16, 4201–9 (1968) (Eng).
POPOV, K. R., " Polarization of absorption bands and assignment of electron of substituted benzenes, *Optics and Spectrosc.* **25**, N 6, 843–8 (1968) (Russ).
PRAUD, L., MILLIE, P. and BERTHIER, G., " Structure electronique comparee des isomeres conjugues du benzene," *Theor. Chim. Acta* **11**, N 2, 169–73 (1968) (Fr).
RAZ, B. and JORTNER, J., " Energy of the quasi-free electron state in liquid and solid rare gases, *Chem. Phys. Letters* **4**, N 3, 155–8 (1969) (Eng).
ROTKIEWICZ, K. and GRABOWSKI, Z. R., " Excited states of aminoanthracenes. An experimental approach to electron density distribution," *Trans. Faraday Soc.* **65**, N 564, 3263–78 (1969) (Eng).
SALTIEL, J., " Perdeuteriostilbene. The triplet and singlet paths for stilbene photoisomerization," *J. Amer. Chem. Soc.* **90**, N 23, 6394–400 (1968) (Eng).
SAMSON, J. A. R., " The electronic states of $C_6H_3^+$," *Chem. Phys. Letters* **4**, N 5, 257–60 (1969) (Eng) (*P.A.* **70**: 17091).
SCHULMAN, J. M. and MOSKOWITZ, J. W., " Benzene and its ionized states," *J. Chem. Phys.* **47**, N 9, 3491–5 (1968) (Eng) (*P.A.* **68**: 7565).
SEN, P. and BASU. S., " Free-electron model for anisotropy of π-electron polarizability in benzene," *Int. J. Quantum Chem.* **3**, N 1, 1–2 (1969) (Eng).
SEN, P. and BASU, S., " Free-electron model for electronic spectra of benzene," *Int. J. Quantum Chem.* **3**, N 5, 611–19 (1969) (Eng).
SHOEMAKER, R. L. and FLYGARE, W. H., " Molecular quadrupole moment, molecular magnetic susceptibilities, and molecular g values in benzene," *J. Chem. Phys.* **51**, N 7, 2988–91 (1969) (Eng).
SINGH, T. R. and WOOD, J. L., " Isotope effects on the hydrogen-bond length," *J. Chem. Phys.* **50**, N 8, 3572–6 (1969) (Eng).
STEPANOV, B. I. and GRIBKOVSKII, V. P., " On the analogy of the optical properties of complex molecules and semiconductors," *Optics and Spectrosc.* **27**, N 4, 583–92 (1969) (Russ) (*P.A.* **70**: 44822).
SUPPAN, P., " Charge-transfer states in aromatic molecules: π-π states," *J. Molec. Spectrosc.* **30**, N 1, 17–28 (1969) (Eng) (*P.A.* **69**: 32495).
TRAMER, A. and ZABOROWSKA, M., " Hydrogen bond and level reversal in excited l-naphthol," *Acta Phys. Polon.* **34**, N 5, 821–833 (1968) (Eng).
UZHINOV, B. M., KOZACHENKO, A. I. and KUZMIN, M. G., " Dipole moments of singlet excited electron states of some naphthalene derivatives," *Zh. Prikl. Spektrosk* **9**, N 6, 1041–6 (1968) (Russ).
VAN BRUIJNSVOORT, A., EILERMANN, L., VAN DER MEER, H. and STAM, C. H., " The geometry of the benzene ring in 1,2,4,5-tetra-tertiarybutylbenzene," *Tetrahedron Letters*, N 21, 2527-9 (1968) (Eng).
YOUNG, W. R. and YANNONI, C. S., " Deuterium as an aromatic substituent. Fluorine chemical shifts in the monodeuteriofluorobenzenes," *J. Amer. Chem. Soc.* **91**, N 16, 4581–2 (1969) (Eng).

3.2. Singlet Absorption Spectra

AVARMAA, R. and REBANE, L., " Rotational structure of vibronic absorption and luminescence spectra of NO_2^- impurity molecules in potassium halide crystals," *Phys. Status Solidi* **35**, N 1, 107–17 (1969) (Eng).
AVARMAA, R. and REBANE, L., " Zero phonon line structure in absorption and luminescence spectra of nitrite ion in potassium halide crystals," *Eesti NSN Tead. Akad. Toim., Fuus., Mat.* **18**, N 1, 117–20 (1969) (Russ).
BAGAL, I. L., " Substituent effects on the electronic spectra of benzene derivatives," *Reakts. Sposobnost. Org. Soedin* **5**, N 2, 402–14 (1968) (Russ) (*C.A.* **70**: 15655).
BELAITS, I. L., NURMUKHAMETOV, R. N., SHIGORIN, D. N. and BYSTRITSKII, G. I., " Electronic spectra and structure of molecules of naphthostyryl and thionaphthostyryl derivatives," *Zh. Fiz. Khim.* **43**, N 7, 1673–8 (1969) (Russ).
BIST, H. D., BRAND, J. C. D. and WILLIAMS, D. R., " The 2750-Å band system of phenyl. II. Extended vibrational assignments and band contour analysis," *J. Mol. Spectrosc.* **24**, N 4, 413–67 (1968) (Eng).
BOLOTNIKOVA, T. N. and SICHKAR, O. N., " Use of the method of quasilinear spectra for studying the effect of heavy atoms on the spectral characteristics of aromatic hydrocarbons," *Optics and Spectrosc.* **26**, N 5, 752–7 (1969) (Russ).
BOLOTNIKOVA, T. N., MALKES, L. Y., NAZARENKO, A. I. and YAKOBENKO, V. N., " Vibrational structure of quasilinear spectra of 4-methyl, 4-meth oxy, 4,4-di meth oxy, 4-eth oxy, and 4-meth oxy carbonyl

substituted stilbenes at 77-deg.-K," *Optics and Spectrosc.* **26**, N 4, 649–51 (1969) (Russ).
BOLOTNIKOVA, T. N., MALKES, L. Y., NAZARENKO, A. I. and YAKOVENKO, V. N., " Vibrational structure of quasilinear spectra of para halo substituted stilbenes at 77-deg.-K," *Optics and Spectrosc.* **26**, N 1, 132–4 (1969) (Russ).
BOLSHAKOV, G. T., *et al.*, *Ultraviolet spectra of heteroorganic compounds*, Leningrad, Khimia (1969) (Russ).
BORISEVICH, N. A. and TOLSTOROZHEV, G. B., " Spectral properties of the fluorescence of the vapors of anthracene derivatives," *Dokl. Akad. Nauk SSSR* **188**, N 2, 303–10 (1969) (Russ) (*P.A.* **70**: 39409).
CEASAR, G. P. and GRAY, H., " Polarized electronic spectroscopy of molecules oriented by a nematic liquid crystal," *J. Amer. Chem. Soc.* **91**, N 1, 191–3 (1969) (Eng).
DULEY, W. W., " Absorption spectrum of Na atoms in C_6H_6 at low temperatures," *Phys. Letters* **27A**, N 4, 206–7 (1969) (Eng) (*P.A.* **68**: 49769).
DUROCHER, G. and LEACH, S., " Matrix and solution concentration effects on the ultraviolet spectra of poly methyl derivatives of benzene at 77-deg.-K. Durene," *J. Chim. Phys. Physicochim. Biol.* **66**, N 4, 628–36 (1969) (Fr).
DUROCHER, G., " Effects of matrix and concentration of solute on the u.v. spectra of the polymethyl derivatives of benzene at 77 °K. II. Hexamethylbenzene," *J. Chim. Phys. Physicochim. Biol.* **66**, N 4, 637–41 (1969) (Fr) (*P.A.* **70**: 15494).
FULTON, A., " Absorption spectra of the anions of quinones and other acceptors in solution and as solids," *Aust. J. Chem.* **21**, N 12, 2847–52 (1968) (Eng).
GALLIVAN, J. B. and BRINEN, J. S., " Polarization of electronic transitions of aromatic hydrocarbons," *J. Chem. Phys.* **50**, N 4, 1590–5 (1969) (Eng).
GALPERINA, N. I., BERENFELD, V. M., BAZOV, V. P. and KRONGAUZ, V. A., " Influence of the charge transfer state on the optical properties of substituted benzenes," *Optics and Spectrosc.* **25**, N 2, 216–21 (1968) (Russ) (*C.A.* **69**: 82040z).
GOBOV, G. V., NURMUKHAMETOV, R. V. and NAKHIMOVSKAYA, L. A., " Absorption spectra of N-paraffin solutions of bi-phenyl base compounds at 77-deg.-K," *Optics and Spectrosc.* **25**, N 2, 227–35 (1969) (Russ).
GOLDBERG, M. C., WERSCHAW, R. L., BABAD, H. and MUELLER, H. W., " Spectral characteristics of polydeuterated toluenes," *Appl. Spectrosc.* **23**, N 3, 242–4 (1969) (Eng).
GOROT, K. F., VALDMAN, M. M., MALYKHINA, N. N. and PAVLOSHCHUK, V. A., " Electronic spectra of halonaphthalenes. Absorption spectra of vapors and frozen crystalline solutions of fluoro- and chloro-substituted naphthalene," *Ukr. Fiz. Zh.* **13**, N 2, 219–24 (1968) (Ukrain).
HOLLOWAY, H. E., NAUMAN, R. V. and WHARTON, J. H., " The electronic structure and spectra of 2-phenylnaphthalene. Ground- and excited-state potential energies as functions of molecular conformation," *J. Phys. Chem.* **72**, N 13, 4474–82 (1968) (Eng).
KATZ, B., BRITH, M., SHARF, B. and JORTNER, J., " Rydberg states of benzene in rare-gas matrices," *J. Chem. Phys.* **50**, N 12, 5195–203 (1969) (Eng).
KEMBROVSKII, G. S., BOBROVICH, V. P. and SEVCHENKO, A. N., " Nature of the ' multiplet ' structure of quasilinear electronic spectra of benzene in cyclo hexane," *Zh. Prikl. Spectrosc.* **10**, N 5, 829–33 (1969) (Russ).
KIMURA, KAZUMI and KAZUMATA, SJUNDZI, " Electronic spectra of organic molecules in excited states," *Kagaku-ne ryoiki, J. Japan Chem.* **23**, N 11, 1013–22 (1969) (Japan).
KLIGER, D. S. and ALBREGHT, A. C., " Nanosecond excited-state polarized absorption spectroscopy of anthracene in the visible region," *J. Chem. Phys.* **50**, N 9, 4109–11 (1969) (Eng) (*P.A.* **69**: 34657).
KLIMOVA, L. A., NERSESOVA, G. N. and GLYADKOVSKII, V. I., " Anthracene aggregates in solutions," *Optics and Spectrosc.* **25**, N 2, 290–2 (1968) (Russ).
KLIMUSHEVA, G. V., PRIKHOTKO, A. F. and SOROKA, G. M., " Absorption spectrum of fluorobenzene crystal," *Optics and Spectrosc.* **25**, N 3, 361–7 (1968) (Russ).
KOZLOV, I. N., SARZHEVSKII, A. M. and KHOMICH, M. I., " Polarization spectra of anthracene derivatives," *Zh. Prikl. Spectrosc.* **9**, N 4, 666–9 (1968) (Russ).
LAND, E. J., " Absorption spectrum of the triplet state of duroquinone," *Trans. Faraday Soc.* **65**, N 563, pt. 11, 2815–22 (1969) (Eng).
LIN, S. H., " Spectral band shape of absorption and emission of molecules in dense media," *Theor. Chim. Acta* **10**, N 4, 301–10 (1968) (Eng).
LYSENKO, G. M. and KISLYAK, G. M., " Effect of ionization on the absorption spectra of complex organic substances," *Zh. Fiz. Khim.* **43**, N 1, 39–44 (1969) (Russ).
MCHUGH, A. J. and ROSS, I. G., " Spectrum of azulene. V. Geometry of the excited state of the 3500Å transition," *Aust. J. Chem.* **21**, N 12, 3055–7 (1968) (Eng).
MCHUGH, A. J. and ROSS, I. G., Spectrum of azulene. VI. Centrifugal distortion and the inertial defect, *Aust. J. Chem.* **22**, N 1, 1–8 (1969) (Eng).
MCHUGH, A. J., RAMSAY, D. A. and ROSS, I. G., Spectrum of azulene. IV. Rotational analysis of the O-O band of the 3500Å transition. *Aust. J. Chem.* **21**, N 12, 2835–45 (1968) (Eng).
MERRITHEW, R. B., MARUSAK, G. V. and BLOUNT, C. E., " Absorption spectra of metal atoms in solid xenon," *J. Mol. Spectrosc.* **29**, N 1, 54–65 (1969) (Eng).
MOISYA, E. G., " Changes in the relative intensities of absorption spectral bands of anthracene in solutions," *Optics and Spectrosc.* **27**, N 1, 177–8 (1969) (Russ).
MEHROTRA, V. K., " Electronic absorption spectra of 2,4-,2,5-, and 2,6-dichlorotoluene," *Indian J. Pure Appl. Phys.* **6**, N 3, 137–40 (1968) (Eng) (*C.A.* **69**: 31756e).
NAKATO, Y., YAMAMOTO, N. and TSUBOMURA, H., " Absorption spectrum of pyrene in the excited singlet state measured by the flash method," *Chem. Phys. Letters* **2**, N 1, 57–8 (1968) (Eng).
NAKHIMOVSKAYA, L. A., " Conditions for the realization of the Spol'sky effect," *Optics and spectrosc.* **24**, N 2, 207–10 (1968) (Russ).
NAKHIMOVSKAYA, L. A., " Nature of the Spol'sky effect," *Izv. Akad. Nauk SSSR, ser. Fiz.* **32**, N 9, 1521–4 (1968) (Russ).
NURMUKHAMETOV, R. N., " Spectroscopy of polyhydric molecules by the Spol'sky method," *Usp. Khim.* **38**, N 2, 351–75 (1969) (Russ).
OHNO, I. and IGUCHI, H., " UV and visible absorption spectra of monohalogenated anthracene. I. The first absorption bands," *Bull. Chem. Soc. Japan* **41**, N 10, 2264–9 (1968) (Eng) (*C.A.* **69**: 7733v).
PERSONOV, R. I. and KOROTAEV, O. N., " Nature of multiplets in the quasilinear spectra of organic molecules," *Dokl. Akad. Nauk SSSR* **182**, N 4, 815–18 (1968) (Russ) (*C.A.* **69**: 15752r).

PERSONOV, R. I. and SOLODUNOV, V. V., "Temperature broadening, shift, and line shape in quasi-linear spectra of organic molecules in crystalline and *n*-paraffin solutions," *Fiz. Tverd. Tela* **10**, N 6, 1848–58 (1968) (Russ) (*P.A.* **68**: 45240).

PERSONOV, R. I. and SOLODUNOV, V. V., "Temperature dependence of some characteristics of quasi-linear spectra of aromatic hydrocarbons in *n*-paraffins," *Izv. Akad. Nauk SSSR, Ser. Fiz.* **32**, N 9, 1480–3 (1968) (Russ).

PFISTER, D. C. and KAHANE-PAILLOUS, J., "Quasi-linear spectra of coronene in N-heptane and N-hexane, effect of thermal treatment of the sample," *J. Chim. Phys.* **65**, N 5, 876–82 (1968) (Fr) (*P.A.* **68**: 45242).

POPOVA, T. N., ELISEEV, A. A. and PRILEZHAEVA, N. A., "Determination of the concentration of molecules in an excited state according to absolute intensities," *Izv. Vyssh. Ucheb. Zaved., Fiz.*, N 3, 155–7 (1969) (Russ).

POWELL, G. L., "The kinetics of the excited singlet and triplet states of vapor phase phenanthrene and anthracene," 1967. 101 pp. Avail. Univ. Microfilms, Ann Arbor, Mich., Order No. 68–2221. *Diss. Abstr. B* **28**, N 8, 3244 (1968) (Eng) (*C.A.* **68**: 14100u).

SAHINI, V. E. and GHIRVU, C. I., "On the electronic structure and spectra of the monosubstituted naphthalenes," *Rev. roumaine chim.* **14**, N 3, 275–82 (1969) (Eng).

SARZHEVSKII, A. M. and KHOMICH, M. I., "Spectral behavior dichroism and oscillator orientation in molecules of anthracene derivatives," *Dokl. Akad. Nauk of BSSR* **13**, N 12, 1070–2 (1969) (Russ).

SHORYGIN, P. P., PETUKHOV, V. A., KHOMENKO, A. K. and CHERNYSHEV, E. A., "Ultraviolet absorption spectra of monosubstituted benzenes," *Zh. Fiz. Khim.* **42**, N 5, 1057–64 (1968) (Russ).

SINGH, I., OGATA, R. T., MOORE, R. E., CHANG, C. W. J. and SCHEUER, P. J., "Electronic spectra of substituted naphthoquinones," *Tetrahedron* **24**, N 18, 6053–73 (1968) (Eng).

SINGH, P. D. and PATHAK, A. N., "Near ultraviolet absorption spectrum of *m*-difluorobenzene vapour," *Indian J. Pure and Appl. Phys.* **7**, N 1, 39–46 (1969) (Eng).

SINGH, S. N. and SINGH, R. S., "Absorption spectrum of 1,4-naphthoquinone in the vapour phase," *Indian J. Pure and Appl. Phys.* **6**, N 4, 187–9 (1968) (Eng) (*P.A.* **68**: 43393).

SINGH, S. N., AMMA, R. A. and SINGH, S. N., "Near ultraviolet emission and absorption spectra of o-chlorotoluene vapour," *Indian J. Pure Appl. Phys.* **7**, N 11, 768–9 (1969) (Eng) (*P.A.* **70**: 17093).

SMITH, J. J. and MEYER, B., "Absorption and phosphorescence spectrum of matrix-isolated ferrocene," *J. Chem. Phys.* **48**, N 12, 5436–9 (1968) (Eng).

SPANGLER, J. D. and KILMER, N. G., "Electronic spectra of benzene in cyclohexane at 77 °K," *J. Chem. Phys.* **48**, N 2, 698–714 (1968) (Eng) (*P.A.* **68**: 27624).

SRIVASTAVA, Y. P., "Electronic absorption spectrum of o-dibromobenzene vapor," *Appl. Spectrosc.* **22**, N 5, pt. 1, 588 (1968) (Eng) (*C.A.* **69**: 156326).

STEPHENS, P. J., SCHATZ, P. N., RITCHIE, A. B. and MCCAFFERY, A. J., "Magnetic circular dichroism of benzene, triphenylene and coronene," *J. Chem. Phys.* **48**, N 1, 132–8 (1968) (Eng).

SVISHCHEV, G. M. and DEMENTEVA, L. A., "Statistical broadening of the spectra of impurity molecules," *Optics and Spectrosc.* **26**, N 1, 55–61 (1969) (Russ).

THAKUR, S. N. and SINGH, N. L., "Shape of *p*-difluorobenzene molecule in $^1B_{2u}$ electronic state," *Indian J. Pure Appl. Phys.* **7**, N 11, 765–7 (1969) (Eng) (*P.A.* **70**: 17096)

THAKUR, G. and UPADHYA, K. N., "The near ultraviolet absorption spectrum of 2,4-dichlorotoluene," *Curr. Sci.* **37**, N 5, 134–5 (1968) (Eng) (*P.A.* **69**: 20955).

TROMBETTI, A. and ZAULI, C., "The $^1B_{2u} \rightarrow {}^1A_{1g}$ transition of benzene and some deuterated benzenes: solvent and temperature effects," *J. Chem. Soc. B*, N 12, 1574–7 (1968) (Eng).

TROMBETTI, A. and ZAULI, C., "Spettro vibrazionale ed elettronico del selenofene," *Corsi e semin. chim. CNR e FG*, N 14, 60 (1968) (Ital).

TUSHISHVILI, L. S., SHCHEGLOVA, N. A., SHIGORIN, D. N. and DOKUNIKHIN, N. S., "Electronic absorption spectra of α- and β-monohaloderivatives of anthraquinone," *Th. Fiz. Khim.* **43**, N 4, 981–4 (1969) (Russ).

USTYUGOVA, L. N. and NAKHIMOVSKAYA, L. A., "Effect of crystalline conditions for *n*-paraffin solutions of some aromatic compounds on their absorption and fluorescence spectra at 77-deg.-K," *Zh. Prikl. Spectrosc.* **9**, N 6, 1053–6 (1968) (Russ).

UTKINA, L. F., "Manifestation of the vibrational structure of anthracene in the spectra of some complex condensed aromatic hydrocarbons," *Zh. Prikl. Spectrosc.* **9**, N 3, 466–9 (1968) (Russ).

UZHINOV, B. M., KOZACHENKO, A. I. and KUZMIN, M. G., "Dipole moments of singlet excited electron states of some naphthalene derivatives," *Zh. Prikl. Spectrosc.* **9**, N 6, 1041–6 (1968) (Russ).

VALDMAN, M. M., MALYCHINA, N. N. and HUDJAKOVA, L. P., "Electronic spectra of clorosubstituted naphthalene," *Zh. Prikl. Spectrosc.* **9**, N 3, 470–4 (1968) (Russ).

WALLACE, R., "Spectroscopic excitation of doubly excited molecular electronic states," *J. Chem. Phys.* **49**, N 4, 1986–7 (1968) (Eng).

WETTERMARK, G., TEGNÉR, L. and MÅRTENSSON, O., "The electronic spectra of stilbene and its naphthyl analogues," *Arkiv kemi* **30**, N 3, 185–212 (1969) (Eng).

YOUNG, W. R. and YANNONI, C. S., "Deuterium as an aromatic substituent. Fluorine chemical shifts in the monodeuteriofluorobenzenes," *J. Amer. Chem. Soc.* **91**, N 16, 4581–2 (1969) (Eng).

ZAIDI, Z. H. and KHANNA, B. N., "Spectroscopic study of anthracene cation trapped in boric-acid glass, *J. Chem. Phys.* **50**, N 8, 3291–6 (1969) (Eng) (*P.A.* **69**: 42423).

ZAIDI, Z. H. and KHANNA, B. N., "Spectroscopic study of phenanthrene cation trapped in boric-acid glass," *Indian J. Pure Appl. Phys.* **7**, N 11, 753–6 (1969) (Eng). (*P.A.* **70**; 17114).

ZAIDI, Z. H. and KHANNA, B. N., "Spectrum of phenanthrene cation in the acid glass," *Curr. Sci.* **37**, N 20, 580–2 (1968) (Eng).

ZAKIS, U. R., "Spectroscopy of molecular centres in crystal phosphors," *Izv. Akad. Nauk SSSR, Ser. Fiz.* **33**, N 6, 999–1000 (1969) (Russ).

ZWEIG, A. and GALLIVAN, J. B., "Spectroscopic studies on the α-phenylated naphthalenes," *J. Amer. Chem. Soc.* **91**, N 2, 260–4 (1969) (Eng) (*P.A.* **69**: 42441).

3.3. Triplet Absorption Spectra and ESR Spectra

ASTIER, R., BOKOBZA, A. and MEYER, Y. H., "Low-energy triplet state of tetracene," *J. Chem. Phys.* **51**, N 11, 5174–5 (1969) (Eng).

ASTIER, R. and MEYER, Y. H., " First allowed triplet-triplet transition in benzene," *Chem. Phys. Letters* **3**, N 6, 399–401 (1969) (Eng) (*P.A.* **70**: 984).
BATLEY, M. and KEARNS, D. R., " The second triplet state of benzophenone," *Chem. Phys. Letters* **2**, N 6, 423–5 (1968) (Eng) (*P.A.* **69**: 15881).
BRINEN, J. S. and ORLOFF, M. K., " Experimental and theoretical study of triplet-triplet absorption in the phenylnaphthalenes," *J. Chem. Phys.* **51**, N 2, 527–31 (1969) (Eng) (*P.A.* **70**: 3689).
BRINEN, J. S. and KOREN, J. G., " The lowest triplet state of 9,10-diphehylanthracene," *Chem. Phys. Letters* **2**, N 8, 671–2 (1968) (Eng).
BROLLEY, J. E., " Vacuum polarization interaction between protons, effective range parameters, and triplet phases," *Aust. J. Phys.* **22**, N 3, 327–35 (1969) (Eng).
BROOKS, A. A., BOSS, B. D., STEJSKAL, E. O. and WEISS, V. W., " Pressure dependence of T_1 in benzene," *J. Chem. Phys.* **48**, N 8, 3826–7 (1968) (Eng).
BULAEVSKII, L. N., " Lower triplet excitation of linear conjugated hydrocarbons," *Teor. Eksp. Khim.* **5**, N 2, 267–8 (1969) (Russ).
CADOGAN, K. D. and ALBRECHT, A. C., " Polarized triplet-triplet absorption spectra in three benzene derivatives," *J. Phys. Chem.* **73**, N 6, 1868–77 (1969) (Eng).
CHAMBERS, R. W. and KEARNS, D. R., " Effect of dimer formation on the triplet states of organic dyes," *J. Phys. Chem.* **72**, N 13, 4718–20 (1968) (Eng).
EDAMURA, T. and KANDA, Y., " Intensity of the T←S absorption of *p*-benzoquinone," *Mem. Fac. Sci. Kyushu Univ., Ser. C* **6**, N 2, 71–3 (1968) (Eng) (*C.A.* **69**: 15653j).
EL-SAYED, M. A., " Recent studies of triplet-singlet transitions in aromatic molecules," *Acta Phys. Polon* **34**, N 4, 649–68 (1968) (Eng) (*P.A.* **69**: 15871).
FAULKNER, L. R. and BARD, A. J., " Magnetic field effects on anthracene triplet-triplet annihilation in fluid solutions," *J. Amer. Chem. Soc.* **91**, N 23, 6495–7 (1969) (Eng).
FAULKNER, L. R. and BARD, A. J., " Wurster's blue cation as an anthracene triplet quencher in fluid solution and the effect of magnetic field on this interaction," *J. Amer. Chem. Soc.* **91**, N 23, 6497–8 (1969) (Eng).
FLOROZAK, J., " On the effective nuclear potential of the interaction between two nucleons in triplet states," *Acta Phys. Polon* **34**, N 4, 833–6 (1968) (Eng).
GINSBURG, J. L. and GOODMAN, L., " Effect of two electron spin-orbit interactions on singlet-triplet transition probabilities," *Mol. Phys.* **15**, N 5, 441–51 (1968) (Eng).
GODFREY, T. S., HILPERN, J. W. and PORTER, G., " Triplet-triplet absorption spectra of benzophenone and its derivatives," *Chem. Phys. Letters* **1**, N 10, 490–2 (1968) (Eng) (*C.A.* **68**: 6877n).
GRIFFIN, R. N., " Triplet behavior of organic compounds," *Photochem. Photobiol* **7**, N 2, 175–87 (1968) (Eng).
GRIVET, J.-P. and PTAK, M., " Acidity determination of β-naphthol triplet state by electron paramagnetic resonance," *C. R. Acad. Sci., Paris* **266B**, N 13, 848–51 (1968) (Fr) (*P.A.* **68**: 34342).
HADLEY, S. G. and KELLER, R. A., " Direct determination of the extinction coefficients for triplet←triplet transitions in naphthalene, phenanthrene, and triphenylene," *J. Phys. Chem.* **73**, N 12, 4351–5 (1969) (Eng) (*P.A.* **70**: 36483).
HEINZELMANN, W. and LABHART, H., " Triplet-triplet spectra and triplet quantum yields of some aromatic hydrocarbons in liquid solution," *Chem. Phys. Letters* **4**, N 1, 20–4 (1969) (Eng) (*P.A.***70**: 3678).
HERSTROETER, W. G. and MCCLURE, D. S., " The lowest triplet state of stilbene," *J. Amer. Chem. Soc.* **90**, N 17, 4522–7 (1968) (Eng) (*P.A.* **69**: 19476).
JOHNSON, G. R. A. and SAUER, M. C., JR., " Pulse radiolysis study of the formation of triplet excited states of naphthalene, anthracene, and biphenyl in cyclohexane vapor," *J. Chem. Phys.* **51**, N 2, 496–501 (1969) (Eng).
KEARNS, D., KHAN, A. U., DUNCAN, C. K. and MAKI, A. H., " Detection of the naphthalene-photosensitized generation of singlet ($^1\Delta_g$) oxygen by paramagnetic resonance spectroscopy," *J. Amer. Chem. Soc.* **91**, N 4, 1039–40 (1969) (Eng).
KHOLMOGOROV, V. E., " Electron paramagnetic resonance method for studying the phototransfer of an electron and sensitized photochemical reactions," *Usp. Khim.* **38**, N 2, 321–50 (1969) (Russ).
KIMURA, K., " Theoretical study of triplet-triplet absorption spectra of mono and *p*-disubstituted benzenes with electron-donating substituents," *Mol. Phys.* **15**, N 2, 109–19 (1968) (Eng).
KLASINC, L. and SOMMER, U., " A theoretical study of T-T-absorption spectra of 1-and 2-substituted naphthalene," *Chem. Phys. Letters* **3**, N 2, 107–9 (1969) (Eng).
KOTTIS, P., " Theory of line shape of RPE of stationary triplet state and moving triplet exciton in molecular aggregates," *Ann. Phys.* **4**, N 4, 459–514 (1969) (Fr).
KRISHNA, V. G. and SALZMAN, W. R., " Singlet-triplet transition probabilities in aromatic hydrocarbons. I. $^1A \rightarrow {}^3L_a$ transitions in linear polyacenes," *J. Chem. Phys.* **50**, N 9, 3875–9 (1969) (Eng).
KROPP, J. L. and WINDSOR, M. W., " Triplet to triplet (T-T) absorption in organic molecules for use in photochromic devices," U.S. Clearinghouse Fed. Sci. Tech. Inform, AD 1968, AD-675323, 72 pp. From U. S. Govt. Res. Develop. Rep. **68**, N 22, 56 (1968) (Eng) (*C.A.* **69**: 72511k).
LAVALETTE, D., " A correlation between SCFMO and HMO calculations of triplet-triplet absorption spectra of alternant hydrocarbons," *Chem. Phys. Letters* **3**, N 5, 264–6 (1969) (Eng).
LAVALETTE, D., " Triplet-triplet absorption of alternant aromatic hydrocarbons. Molecular extinction coefficients and oscillator strengths," *J. Chim. Phys.* (*France*) **66**, N 11–12, 1853–9 (1969) (Fr).
LAVALETTE, D., " Triplet-triplet absorption of alternant aromatic hydrocarbons. Symmetry of triplet levels and classification of transitions," *J. Chim. Phys.* (*France*) **66**, N 11–12, 1845–52 (1969) (Fr).
LAVALETTE, D., " Triplet-triplet absorption of alternant aromatic hydrocarbons. Polarization of transitions," *J. Chim. Phys.* (*France*) **66**, N 11–12, 1860–4 (1969) (Fr).
MARCHETTI, A. P., " Singlet-triplet absorption spectra of various aromatic hydrocarbons by the phosphorescence excitation method. Photoelectric properties of some aromatic hydrocarbons," *Diss. Abstr. B*, **28**, N 10, 4093 (1968) (Eng) (*C.A.* **69**: 31743y).
MARTINEZ, A., " Occurrence of T←T absorption during the measurement of the rate of decrease of T→S phosphorescence," *C. R. Acad. Sci., Paris 266B*, N 22, 1394–6 (1968) (Fr) (*C.A.* **69**: 56013y).
MATSUZAWA, M., " Electron-impact excitation cross sections of the lowest-lying triplet states of benzene," *J. Chem. Phys.* **51**, N 11, 4705–9 (1969) (Eng).
MOSS, R. E., ASHFORD, N. A., LAWLER, R. G. and FRAENKEL, G. K., " Electron spin resonance spectra of methyl-substituted naphthalene anion radicals," *J. Chem. Phys.* **51**, N 5, 1765–90 (1969) (Eng).

NAUMOVA, T. M. and GLYADKOVSKII, V. I. " Use of luminescence excitation spectra for determining triplet-triplet absorption bands for some aromatic hydrocarbons in frozen paraffin solutions," *Optics and Spectrosc.* **27**, N 2, 228–31 (1969) (Russ).
NISHIKAWA, M. and SAUER, M. C., JR., " Formation of the triplet state of naphthalene in the pulse radiolysis of gaseous mixtures of benzene and naphthalene," *J. Chem. Phys.* **51**, N 1, 1–9 (1969) (Eng).
NOUCHI, G., " Study and interpretation of triplet-triplet absorption spectra. Classification of upper triplet states; I. Dyes," *J. Chim. Phys. (France)* **66**, N 3, 548–53 (1969) (Fr) (*P.A.* **70**: 14271).
NOUCHI, G., " Study and interpretation of triplet-triplet absorption spectra. Classification of upper triplet states; II. Aromatic hydrocarbons," *J. Chim. Phys. (France)* **66**, N 3, 554–65 (1969) (Fr) (*P.A.* **70**: 17316w).
NURMUKHAMETOV, R. N., PISKUNOV, A. K. and SHIGORIN, D. N., " Molecular structure and initiation of a photochemical reaction with participation of the triplet state," *Zh. Fiz. Khim.* **43**, N 6, 1177–84 (1969) (Russ).
ORTEGA, S., KANDEL, L. D., PASSEGGI, M. C. and BUCH, T., " Vibrational structure of EPR-spectra?," *Chem. Phys. Letters* **3**, N 1, 35–6 (1969) (Eng).
POWELL, G. L., " The kinetics of the excited singlet and triplet states of vapor phase phenanthrene and anthracene," 1967, 101 p. Avail Univ. Microfilms, Ann Arbor, Mich., Order No. 68–2221. *Diss. Abstr. B* **28**, N 8, 3244 (1968) (Eng) (*C.A.* **68**: 14100u).
PURINS, D. and KARPLUS, M., " Spin delocalization and vibrational-electronic interaction in the toluene ion-radicals," *J. Chem. Phys.* **50**, N 1, 214–33 (1969) (Eng).
THOMSON C. and MACCULLOCH, W. J., " E.S.R. spectrum of the cation radical of perfluoronaphthalene ($C_{10}F_8$)," *Tetrahedron Letters*, N 56, 5899–900 (1968) (Eng).
VAN BROEKHOVEN, J. A. M., VAN WILLIGEN, H. and de BOER, E., " Counter-ion effects on the spin density distribution in triplet aromatic dianions," *Mol. Phys.* **15**, N 1, 101–3 (1968) (Eng).
WINDSOR, M. W. and DAWSON, W. B., " Quantum efficiencies of triplet formation in aromatic molecules," *Mol. Cryst.* **4**, N 1–4, 253–8 (1968) (Eng) (*P.A.* **69**: 16438).
ZHURAVLYOVA, T. S., " Determination of triplet-triplet absorption spectra by means of two quantum photosensitized reactions," *Optics and Spectrosc.* **25**, N 5, 696–700 (1968) (Russ) (*C.A.* **69**: 72485e).

3.4. Electronic-vibrational Interaction and Vibronic Spectra

ALEKSANDROV, A. P., BREDIKHIN, V. I. and GENKIN, V. N., " Electronic-vibrational nature of two quantum absorption in centrosymmetric organic molecules," *Pis'ma Zh. Eksp. Teor. Fiz.* **10**, N 4, 185–8 (1969) (Russ).
BAYLISS, N. S., " The effect of intermolecular interaction on the intensity of weak or forbidden electronic transitions," *J. Mol. Spectrosc.* **31**, N 3, 406–18 (1969) (Eng).
BECKER, R. S., DOLAN, E. and BALKE, D. E., " Vibronic effects in photochemistry-competition between internal conversion and photochemistry," *J. Chem. Phys.* **50**, N 1, 239–45 (1969) (Eng).
CALDWELL, D. J., " Vibronic theory of circular dichroism," *J. Chem. Phys.* **51**, N 3, 984–8 (1969) (Eng).
CRAIG, D. P. and SMALL, G. J., " Totally symmetric vibronic perturbations and phenanthrene 3400 Å spectrum," *J. Chem. Phys.* **50**, N 9, 3827–34 (1969) (Eng).
DUROCHER, G., " Fluorescence spectrum of pentamethylbenzene. Matrix effects on the vibronic structure," *J. Chim. Phys. (France)* **66**, N 5, 985–7 (1969) (Fr) (*P.A.* **70**: 15532).
LIM, E. C., LI, R. and LI, Y. H., " Vibronic interactions between $n\pi$ and $\pi\pi$ states of polycyclic azines and aromatic aldehydes: a study of perturbing from phosphorescence spectrum," *J. Chem. Phys.* **50**, N 11, 4925–33 (1969) (Eng) (*P.A.* **69**: 42426)
LUKASHIN, A. V., PERMOGOROV, V. I. and FRANK-KAMENETSKY, M. D., " Computations of electron vibrational spectra of conjugated hydrocarbons," *Dokl. Akad. Nauk SSSR* **183**, N 4, 874–7 (1968) (Russ).
LUKASHIN, A. V. and FRANK-KAMENETSKY, M. D., " Theory of electron vibrational spectra of polyatomic molecules," *Dokl. Akad. Nauk SSSR* **188**, N 2, 391–4 (1969) (Russ).
MARTINENAS, B. P., " The application of the symmetry theory for investigation of the electronic-vibronic interaction in the molecules," *Litovsk. Fiz. Sbornic* **8**, N 1–2, 97–106 (1968) (Russ) (*P.A.* **69**: 30005).
MIKHAILENKO, V. I. and TEPLYAKOV, P. A., " Vibrational symmetry and the selection rules in luminescence spectra of aromatic compounds," *Izv. Akad. Nauk SSSR, Ser. Fiz.* **32**, N 9, 1591–5 (1968) (Russ).
PAVLOPOULOS, T. G., " Vibronic spin-orbit interaction in the phosphorescence spectrum of phenazine, *J. Chem. Phys.* **51**, N 7, 2936–40 (1969) (Eng).
PERRIN, M. H., GOUTERMAN, M. and PERRIN, C. L., " Vibronic coupling: VI. Vibronic borrowing in cyclic polyenes and porphyrin," *J. Chem. Phys.* **50**, N 10, 4137–50 (1969) (Eng).
PURINS, D. and KARPLUS, M., " Spin delocalization and vibrational-electronic interaction in the toluene ion-radicals," *J. Chem. Phys.* **50**, N 1, 214–33 (1969) (Eng).
SAVIN, F. A., " Electronic vibrational spectra of polyatomic molecules," *Optics and Spectrosc.* **26**, N 1, 114–16 (1969) (Russ).
SAVIN, F. A., " Vibrational structure in the electronic spectra of some polyatomic molecules," *Optics and Spectrosc.* **25**, N 6, 836–42 (1968) (Russ).
SCHLAG, E. W., YAO, S. J. and VON WEYSSENHOFF, H., " Relaxation theory for modulation excitation of vibronic states," *Chem. Phys.* **50**, N 2, 732–6 (1969) (Eng) (*C.A.* **69**: 72562c).
SHARF, B. and SILBEY, R., " Comments on the vibronic line-width of an isolated resonance of a higher electronic state," *Chem. Phys. Letters* **4**, N 7, 423–5 (1969) (Eng).
SHEKA, E. F., *Electronic-vibrational spectra of molecules and crystals.* Preprint of the Institute of Solid State Physics, Moscow (1969) (Russ).
SMITH, W. L. and WARSOP, P. A., " Franck-Condon principle and large change of shape in polyatomic molecules," *Trans. Faraday Soc.* **64**, N 545, pt. 5, 1165–73 (1968) (Eng).
SUCRE, M. G., GÉNY, F. and LEFEBVRE, R., " Intensity patterns in absorption and fluorescence spectra of molecular dimers: a comparison between the vibronic and the Born-Oppenheimer approach," *J. Chem. Phys.* **49**, N 1, 458–64 (1968) (Eng).
TOLKACHEV, V. A., " Combining states in electron vibrational transfers," *Izv. Akad. Nauk SSSR, Ser. Fiz.* **32**, N 9, 1492–5 (1968) (Eng).
YOUNG, J. H., " Vibronic coupling in the dimer," *J. Chem. Phys.* **49**, N 6, 2566–73 (1968) (Eng).

3.5. Vibrational Spectra

ALIX, A. and BERNARD, L., " Energy distributions of the molecular vibrations of polyatomic molecules," *C.R. Acad. Sci., Paris* **269 A** and **B**. N 17, p 812-15 (1969) (Fr).

ANDERSON, A. B., HANDY, N. C. and PARR, R. G., " Relationships between vibrational force constants and quadrupole coupling constants for molecules and solids," *J. Chem. Phys.* **50**, N 8, 3634-5 (1969) (Eng).

ARKHANZEL'SKAYA, O. I., GIRIN, O. P. and BAKHSHIEV, N. G., " Effect of intermolecular interactions of the vibrational spectra of molecules. Infrared spectra of hydrogen halides," *Optics and Spectrosc.* **27**, N 4, 778-83 (1969) (Russ) (*P.A.* **70**: 43112).

BAILEY, R. T., " The fundamental vibrations of methyl tetrafluorobenzene," *Spectrochim. Acta* **25A**, N 9, 1563-8 (1969) (Eng) (*P.A.* **70**: 7011).

BAILEY, R. T. and HASSON, S. G., " The vibrational spectra of pentafluorotoluene," *Spectrochim. Acta* **25A**, N 2, 467-73 (1969) (Eng).

BAILEY, R. T. and HASSON, S. G., " The vibrational spectra of perfluorotoluene," *Spectrochim. Acta* **24A**, N 12, 1891-8 (1968) (Eng) (*P.A.* **69**: 20973).

BARNES, A. J. and HALLMAN, H. E., " Infrared studies of matrix-isolated species," *Quarterly Rev.* **23**, N 3, 392-409 (1969) (Eng).

BROWNLEE, R. T. C., ENGLISH, P. J. Q., KATRITZKY, A. R. and TOPSOM, R. D., " Infrared intensities as a quantitative measure of intermolecular interaction. VII. The ν_{13} band near 1500 cm^{-1} in mono-substituted and para-disubstituted benzenes," *J. Phys. Chem.* **73**, N 3, 557-64 (1969) (Eng).

CHATTOPADHYAY, S. and JHA, J., " On the vibrational spectra of some monosubstituted benzene compounds," *Indian J. Phys.* **42**, N 10, 610-20 (1968) (Eng) (*P.A.* **69**: 44352).

CONSTANTINE, P. R. and TOPSOM, R. D., " The infra-red spectra of naphthalene derivatives in the 2000-1650 cm^{-1} region-II. 1,5- 1,5- and 1,8-disubstituted naphthalenes," *Spectrochim. Acta* **24A** N 9, 1405-10 (1968) (Eng). (*C.A.* **69**: 72373w).

DACA, T., " New force constants of benzene," *Acta Phys. Polon.* **33**, N 5, 759-67 (1968) (Eng) (*C.A.* **70**: 72152u).

DUINKER, J. C., and MILLS, I. M., " Normal coordinates for the planar vibrations of benzene," *Spectrochim. Acta* **24A**, N 4, 417-35 (1968) (Eng).

FEDOROV, V. P., VOLKOV, V. E. and KORSHUNOV, A. V., " Effect of the aggregate state and nature of the substituents on the vibrational spectra of halo substituted benzenes and anilines in the low frequency region," *Zh. Prikl. Spectros c.* **10**, N 2, 264-8 (1969) (Russ).

FLOROZAK, J., " On the effective nuclear potential of the interaction between two nucleons in triplet states," *Acta Phys. Polon.* **34**, N 5, 833-6 (1968) (Eng).

GATES, P. N., RADCLIFFE, K. and STEELE, D., " The vibrational spectra of mono and para disubstituted halogenobenzenes," *Spectrochim. Acta* **25A**, N 3, 507-16 (1969) (Eng) (*C.A.* **69**: 91980d).

GHOSH, B. C. and BASU, S., " Solvent effect on vibrational spectra," *J. Chim. Phys.* (*France*) **66**, N 5, 903-5 (1969) (Eng).

GRIBOV, L. A., " On the formulation and solution of an inverse spectral problem in the theory of vibration frequencies of polyatomic molecules," *Optics and Spectrosc.* **26**, N 1, 50-4 (1969) (Russ).

GUIRIN, O. P. and BAHSHIEV, N. G., " Influence of intermolecular interaction on vibrational spectra of molecules," *Optics and Spectrosc.* **24**, N 6, 910-15 (1968) (Russ).

HOLZER, W., MURPHY, W. F. and BERNSTEIN, H. J., " Raman spectra of negative molecular ions doped in alkali halide crystals," *J. Mol. Spectrosc.* **32**, N 1, 13-32 (1969) (Eng).

KAKIUTI, Y., SUZUKI, Y. and ONDA, M., " Absolute intensities of C - H out-of-plane combination bands for benzene derivatives in CS_2 solution," *J. Mol. Spectrosc.* **27**, N 1-4, 402-27 (1968) (Eng).

KRUSHINSKII, L. L. and SAFARYAN, F. P., " Theory of infrared spectra connected with nuclear vibrations in crystals and polyatomic molecules," *Dokl. Akad. Nauk Arm. SSR* **48**, N 1, 36-42 (1969) (Russ).

LEROY, A. and DAYAN, E., " Matrix technique analysis of the multiplet structure of the infrared spectra of molecular crystals," *C.R. Acad. Sci., Paris* **268B**, N 1, 48-50 (1969) (Fr) (*P.A.* **69**: 18199).

LUTSKII, A. E., GRANZHAN, V. A. and SEMENENKO, S. B., " Infrared spectra of some 2,6-disubstituted phenol," *Zh. Strukt. Khim.* **10**, N 1, 56-9 (1969) (Russ).

MARCOU, A. and PINTON, M. H., " Carbon-hydrogen and carbon-deuterium vibrational frequencies of *p*-substituted DC_6H_4X derivatives of monodeuterobenzene," *C.R. Acad. Sci., Paris* **266A** and **B**, N 14, 917-19 (1968) (Fr).

MAURING, T., " Infrared absorption of borite molecular ions in alkali metal halide crystals," *Eesti NSV Tead. Akad. Toim., Fuus., Mat.*, N 2, 232-4 (1968).

MEHROTRA, V. K., " Infrared absorption spectra of 2,4-, 2,5- and 2,6-dichlorotoluenes," *Indian J. Pure Appl. Phys.* **6**, N 12 691-3 (1968) (Eng).

NIKOLAENKO, P. T. and ARTAMONOV, A. A., " Investigation of the intermolecular dynamics of the condensed states of a body by the vibrational spectroscopy method. II. Analysis of possible changes in intermolecular spectra during the liquid-solid phase transition," *Izv. Vyssh. Ucheb. Zaved., Fiz.* N 2, 153-5 (1969) (Russ) (*P.A.* **69**: 44386).

NOYES, W. A., JR. and HARTER, D. A., " Vibrational effects in the xylenes," *J. Amer. Chem. Soc.* **91**, N 27, 7585-9 (1969) (Eng).

O'REILLY, E. J., " Out-of-plane force constants of benzene," *J. Chem. Phys.* **51**, N 5, 2206-9 (1969) (Eng) (*P.A.* **70**: 14285).

PAGE, T. F., JR., " On the ^1H - ^1H coupling constants in meta-substituted nitro-and chlorobenzenes," *Mol. Phys.* **14**, N 1, 99-100 (1968) (Eng).

RADCLIFFE, K. and STEELE, D., " The force field for the out-of-plane vibrations of halogenated aromatic molecules," *Spectrochim. Acta* **25A**, N 3, 597-603 (1969) (Eng).

RAJESWARA, RAO N. and SAKKU, S., " The problem of forbidden fundamentals in the Raman and infra-red spectra of liquid benzene," *Indian J. Phys.* **42**, N 5, 316-17 (1968) (Eng).

SCHERER, J. R., " Group vibrations of substituted benzenes-III. Nonplanar vibrations," *Spectrochim. Acta* **24A**, N 6, 747-70 (1968) (Eng) (*C.A.* **68**: 14313r).

SCHRÖTTER, H. W. and BOFILIAS, J., " On the assignment of the second-order lines in the Raman spectrum of benzene," *J. Mol. Structure* **3**, N 3, 242-4 (1969) (Eng).

SHURVELL, H. F., BLAIR, A. S. and JAKOBSEN, R. J., " The infrared and Raman spectra of pentafluorobenzonitrile," *Spectrochim. Acta* **24A**, N 9, 1257-66 (1968) (Eng).

SINGH, S. N. and SINGH, R. S., " Vibrational spectra of condensed ring quinones. I. 1,4-naphthoquinone and 9,10-anthraquinone," *Spectrochim. Acta* **24A**, N 10, 1591-7 (1968) (Eng) (*P.A.* **69**: 23156)

SINGH, T. R. and WOOD, J. L., " Isotope effect on the hydrogen-bond length," *J. Chem. Phys.* **50**, N 8, 3572–6 (1969) (Eng).
SIRKAR, S. C. and BISHUI, P. K., " On the assignment of some vibration frequencies of a few substituted benzenes," *Indian J. Phys.* **42**, N 1, 1–10 (1968) (Eng).
THAKUR, G., SINGH, S. N. and SINGH, N. L., " Infrared absorption spectrum of I-(Chloromethyl) naphthalene," *Indian J. Pure Appl. Phys.* **6**, N 10, 575–6 (1968) (Eng).
TRIC, C., " A self-consistent calculation of benzene vibrations," *Mol. Phys.* **15**, N 2, 205–13 (1968) (Eng).
TROMBETTI, A. and ZAULI, C., " Spettro vibrationale ed alettronico del selenofene," *Corsi e semin. chim. C.N.R. e FG.*, N 14, 60 (1968) (Ital).
UNO, T. MACHIDA, K. and HANAI, K., " Infrared spectra of benzene- and pentadeuterobenzenesulphonyl compounds," *Spectrochim. Acta* **24A**, N 11, 1705–12 (1968) (Eng) (*C.A.* **69**: 111681s).
VALENTE, S. M. I., " Estudo por espectrometria no infravermelho de derivados naftalenicos entre 1700 e 650 CM^{-1}, derivados 1,4 e 1,5 substituidos," *Rev. portug quim.* **10**, N 2, 65–86 (1968) (Port).
WILLIAMS, M. W., MACRAE, R. A., HAMM, R. N. and ARAKAWA, E. T., " Collective oscillations in pure liquid benzene," *Phys. Rev. Letters* **22**, N 21, 1088–91 (1969) (Eng).
ZHIGUNOVA, I. A., " Vibrations of monosubstituted benzenes in the first excited electron states," *Optics and Spectrosc.* **26**, N 2, 173–6 (1969) (Russ).

3.6. Fluorescence

ANDERSON, E. M. and KISTIAKOWSKY, G. B., " Pressure dependence of benzene fluorescence," *J. Chem. Phys.* **48**, N 10, 4787–8 (1968) (Eng) (*P.A.* **68**: 47640).
ANGEL Y. and SIGNORE, R., " Electroluminescence of aromatic hydrocarbons in the liquid phase below the optical excitation threshold," *C.R. Acad. Sci., Paris* **266B**, N 13, 870–3 (1968) (Fr).
AVARMAA, R. and REBANE, L., " Rotational structure of vibronic absorption and luminescence spectra of NO_2^- impurity molecules in potassium halide crystals," *Phys. Status solidi* **35**, N 1, 107–17 (1969) (Eng).
AVARMAA, R. and REBANE, L., " Zero phonon line structure in absorption and luminescence spectra of nitrite ion in potassium halide crystals," *Eesti NSN Tead. Akad. Tiom., Fuus., Mat.* **18**, N 1, 117–120 (1969) (Russ).
BAUER, R. K., " Emission anisotropy of fluorescence of anthracene solutions. I," *Acta Phys. Polon.* **35**, N 1, 101–16 (1969) (Eng).
BIRKS, J. B. and GEORGHIOU, S., " Energy transfer in organic systems. VII. Effect of diffusion on fluorescence decay," *J. Phys. B, Proc. Phys. Soc.* Ser. 2, **1**, N 5, 958–65 (1968) (Eng) (*C.A.* **69**: 11817r).
BOJARSKI, C., " Some remarks on the multilayer model of a luminescence center," *Acta Phys. Polon.* **34**, N 5, 853–7 (1968) (Eng).
BOLOTNIKOVA, T. N., MALKES, L. Y., NAZARENKO, A. I. and YAKOVENKO, V. N., " Vibrational structure of quasilinear spectra of parahalosubstituted stilbenes at 77-deg.-K," *Optics and Spectrosc.* **26**, N 1, 132–4 (1969) (Russ).
BOLOTNIKOVA, T. N., MALKES, L. Y., NAZARENKO, A. I. and YAKOVENKO, V. N., " Vibrational structure of quasilinear spectra of 4-methyl, 4-methoxy, 4,4'-dimethoxy, 4-ethoxy, and 4-methoxy carbonyl substituted stilbenes at 77-deg.-K," *Optics and Spectrosc.* **26**, N 4, 649–51 (1969) (Russ).
BORISEVICH, N. A. and KOTOV, A. A., " Prolonged luminescence of anthraquinone and benzophenone vapors," *Izv. Akad. Nauk SSSR, Ser. Fiz.* **32**, N 8, 1332–5 (1968) (Russ).
BRINEN, J. S., ORLOFF, M. K., GALLIVAN, J. B., STAMM, R. F. and ROBERTS, B. G., " Radiative and radiationless rate constants of aromatic hydrocarbons. Chrysenes," *J. Mol. Spectrosc.* **32**, N 3, 368–374 (1969) (Eng).
CHEN, T.-H., " Effect of exciting wavelength and foreign gases on fluorescence and intersystem crossing in benzene vapor," *Diss. Abstr. B*, **28**, N 12, 4962 (1968) (Eng) (*C.A.* **69**: 82038e).
CHRISTOPHOROU, L. G., ABU-ZEID, M. E. M. and CARTER, J. G., " Emission and decay of liquid-benzene and naphthalene derivatives excited by electron impact," *J. Chem. Phys.* **49**, N 9, 3775–82 (1968) (Eng) (*C.A.* **69**: 33007f).
CHUKOVA, Yu. P., " Thermodynamic limit of the luminescence efficiency," *Pis'ma Zh. Eksp. Teor. Fiz* **10**, N 9, 459–60 (1969) (Russ) (*P.A.* **70**: 24035).
DAWSON, W. R. and KROPP, J. L., "Radiationless deactivation and anomalous fluorescence of singlet 1,12-benzperylene," *J. Phys. Chem.* **73**, N 6, 1752–8 (1969) (Eng).
DHINGRA, R. C. and POOLE, J. A., " Anomalous emission from substituted Hafner's hydrocarbons," *J. Chem. Phys.* **48**, N 11, 4829–32 (1968) (Eng).
DODONOVA, N. Y. and VINOGRADOV, I. P., " Luminescence of naphthalene derivatives containing a carbonyl amide group excited by vacuum ultraviolet radiation," *Optics and Spectrosc.* **27**, N 1, 179–80 (1969) (Russ).
DOUGLAS, A. E. and MATHEWS, C. W., " Benzene fluorescence yields at pressures below 0.1 torr," *J. Chem. Phys.* **48**, N 10, 4788–9 (1968) (Eng) (*P.A.* **68**: 47641).
DURHAM, J. L., SEMELUK, G. P. and UNGER, I., " Spectrofluorometric studies; III. Ortho- and para-difluorobenzene," *Canad. J. Chem.* **46**, N 20, 3177–82 (1968) (Eng).
DUROCHER, G., " Fluorescence spectrum of pentamethylbenzene. Matrix effects on the vibronic structure," *J. Chim. Phys. (France)* **66**, N 5, 985–7 (1969) (Fr) (*P.A.* **70**: 15532).
EREMENKO, A. M., SHEKA, F. F., PIONTKOVSKAYA, M. A. and NEIMARK, I. E., " Luminescence spectra and adsorption properties of naphthalene on different metal substituted forms of zeolite type X," *Teor. Eksp. Khim.* **5**, N 2, 242–7 (1969) (Russ).
FRANKEVICH, E. L., MORROU, I. and SALMAN, G. A., " Effect of an electric field on the radiation induced fluorescence of solutions of aromatic hydrocarbons in cyclohexane," *Pis'ma Zh. Eksp. Teor. Fiz.* **8**, N 9, 466–9 (1968) (Russ).
GALLIVAN, J. B., " Luminescence characteristics of phenyl- and halophenylnaphthalenes," *J. Phys. Chem.* **73**, N 9 3070–5 (1969) (Eng).
GÁTI, L., " Investigations on connections between decay time of fluorescent solutions and other fluorescence characteristics," *Acta Phys. et Chem.* **15**, N 1-2, 5–17 (1969) (Eng).
GELDOF, P. A., RETTSCHNICK, R. P. H. and HOYTINK, G. J., " Fluorescence from the second excited singlets of pyrene and 3,4-benzpyrene," *Chem. Phys. Letters* **4**, N 2, 59–61 (1969) (Eng) (*P.A.* **70**: 7025).
GRAY, E. W. and OGRYZLO, E. A., " The cooperative emission bands of ' singlet ' molecular oxygen," *Chem. Phys. Letters* **3**, N 9, 658–60 (1969) (Eng).

GREENLEAF, J. R., LUMB, M. D. and BIRKS, J. B., "Molecular and excimer fluorescence of toluene," *J. Phys. B, Proc. Phys. Soc.* **1**, N 6, 1157–9 (1968) (Eng) (*C.A.* **69**: 42632h).
HAMILTON, T. D. S. and NAQVI, K. R., "Isosbestic points in emission spectra," *Chem. Phys. Letters* **2** N 6, 374–8 (1968) (Eng).
HEIN, D. E. and OFFEN, H. W., "Fluorescence spectra in frozen heptane at high pressures," *Mol Cryst.* **5**, N 3, 217–27 (1969) (Eng).
HIRAYAMA, F. and LIPSKY, S., "Fluorescence of saturated hydrocarbons," *J. Chem. Phys.* **51**, N 8, 3616–7 (1969) (Eng).
JABLONSKI, A., "Does the intensity distribution within the photoluminescence band depend on the frequency of the exciting light? Additional remark," *Bull. l'acad. polon. sci., Ser. Sci. Math., Astron., Phys.* **15**, N 12, 885–8 (1968) (Fr) (*P.A.* **68**: 21695).
KIM, J. J., BEARDSLEE, R. A., PHILLIPS, D. T. and OFFEN, H. W., "Fluorescence lifetimes of pyrene monomer and excimer at high pressures," *J. Chem. Phys.* **51**, N 6, 2761–2 (1969) (Eng) (*P.A.* **70**: 18730).
KLIMOVA, L. A., NERSESOVA, G. N., NAUMOVA, T. M., OGLOBLINA, A. I. and GLYADKOVSKII, V. I., "Nature of the centers of luminescence in frozen paraffin solutions," *Izv. Akad. Nauk SSSR, Ser. Fiz.* **32**, N 9, 1471–4 (1968) (Russ).
KLOCHKOV, V. P. and KOROTKOV, S. M., "Discontinuous fluorescence spectrum of 9-methylanthracene vapour," *Optics and Spectrosc.* **25**, N 6, 970–2 (1968) (Russ).
KROPP, J. L., DAWSON, W. R. and WINDSOR, M. W., "Radiative and radiationless processes in aromatic molecules. Pyrene," *J. Phys. Chem.* **73**, N 6, 1747–52 (1969) (Eng).
LAWSON, C., HIRAYAMA, F. and LIPSKY, S., "Emission of liquid benzene: comparison of 1849 Å and 2537 Å excitation," *Molec. Lumin., Int. Conf. 1968*, New York, W. A. Benjamin, Inc., 837–49 (1969) (Eng) (*C.A.* **69**: 26289s).
LEACH, S., LOPEZ-CAMPILLO, A., LOPEZ-DELGADO, R. and TOMAS-MAGOS, M. C., "The luminescence of benzene in the pure crystalline state and in crystalline solution as a function of concentration and thermal treatment," *Proc. Int. Conf. Luminescence*, Budapest, 1966, 1, Budapest, Akademiai Kiado, 270–4 (1968) (Eng) (*P.A.* **70**: 12573).
LEE, E. K. C., SCHMIDT, M. W., SHORTRIDGE, R. G., JR. and HANINGER, G. A., JR., "Fluorescence quenching by singlet energy transfer. I. From benzene and toluene to π-bonded molecules," *J. Phys. Chem.* **73**, N 6, 1805–15 (1969) (Eng).
LIN, S. H., "Spectral band shape of absorption and emission of molecules in dense media," *Theor. Chim. Acta.* **10**, N 4, 301–10 (1968) (Eng).
LUMB, M. D., BRAGA, C. L. and PEREIRA, L. C., "Emission spectra and phosphorescence lifetime of benzene solutions at 77 °K, as a function of concentration and excitation wavelength," *Trans. Faraday Soc.* **65**, pt. 8, N 560, 1992–9 (1969) (Eng) (*P.A.* **70**: 34823).
LUNINA, E. V., MAMLEEVA, N. A., ANTIPINA, T. V. and GOLUBEV, V. B., "Interaction of anthraquinone and anthracene with the surface of a fluorinated aluminum oxide," *Zh. Fiz. Khim.* **43**, N 4, 976–9 (1969) (Russ).
MALBIN, M. D. and MARK, H. B., JR., "The electrochemiluminescence of the diphenylanthracene radical anion," *J. Phys. Chem.* **73**, N 8, 2786–7 (1969) (Eng).
MARTINEZ, A. and DORIGNAC, O., "Thermoluminescence mechanism of the delayed fluorescence of phenanthrene-d_{10} in different rigidified solvents," *C.R. Acad. Sci. Paris*, **266 A** and **B**, N 10, 605–607 (1968) (Fr).
MIKHAILENKO, V. I. and TEPLYAKOV, P. A., "Vibrational symmetry and the selection rules in luminescence spectra of aromatic compounds," *Izv. Akad. Nauk SSSR, Ser. Fiz.* **32**, N 9, 1591–5 (1968) (Russ).
NAKHIMOVSKAYA, L. A., "Conditions for the realization of the Spol'sky effect," *Optics and Spectrosc.* **24**, N 2, 207–10 (1968) (Russ).
NAKHIMOVSKAYA, L. A., "Nature of the Spol'sky effect," *Izv. Akad. Nauk SSSR, Ser. Fiz.* **32**, N 9, 1521–4 (1968) (Russ).
PARKER, C. A. and SHORT, G. D., "Comment on the electrochemiluminescence from phenanthrene solutions," *J. Phys. Chem.* **72**, N 8, 3071 (1968) (Eng).
PELLOIS, A. and RIPOCHE, J., "Quasilinear fluorescence spectrum of pyrene trapped in methylcyclopentane at very low temperature," *Chem. Phys. Letters* **3**, N 5, 280–2 (1969) (Eng).
PERSONOV, R. I. and SOLODUNOV, V. V., "Temperature dependence of the line intensities in quasilinear fluorescence spectra," *Fiz. Tverd. Tela* **11**, N 10, 2890–3 (1969) (Russ).
PFISTER, D. C. and KAHANE-PAILLOUS, J., "Quasi-linear spectra of coronene in *n*-heptane and *n*-hexane, effect of thermal treatment of the sample," *J. Chim. Phys. (France)*, **65**, N 5, 876–82 (1968) (Fr) (*P.A.* **68**: 45242).
PHILLIPS, D. H. and SOHUG, J. C., "Luminescence from aromatic polymers, monomers, and dimers under high-energy electron excitation," *J. Chem. Phys.* **50**, N 8, 3297–306 (1969) (Eng) (*P.A.* **69**: 43259).
POPOVA, T. N., ELISEEV, A. A. and PRILEZHAEVA, N. A., "Determination of the concentration of molecules in an excited state according to absolute intensities," *Izv. Vyssh. Ucheb. Zaved., Fiz.*, N 3, 155–7 (1969) (Russ).
REBANE, K. K., AVARMAA, R. A. and REBANE, L. A., "Luminescence quantum yield dependence of impurity nitrite molecules in potassium halide crystals on the exciting light frequency," *Izv. Akad. Nauk SSSR, Ser. Fiz.* **32**, N 8, 1381–5 (1968) (Russ).
RIPOCHE, J. and PELLOIS, A., "Fluorescence spectrum of pyrene trapped in methylcyclopentane at low temperature," *C.R. Acad. Sci., Paris* **268B**, N 3 237–40 (1969) (Fr).
RUBIN, P. L. and SOKOLOVSKII, R. I., "Variation of radiation frequency in resonance fluorescence," *Zh. Eksp. Teor. Fiz.* **56**, N 1, 362–9 (1969) (Russ) (*P.A.* **69**: 31130).
SAARI, P. and REBANE, K., "Hot luminescence lines in the secondary radiation spectrum of KCl-NO_2^- and KBr-NO_2^- crystals," *Solid State Communs* **7**, N 12, 887–90 (1969) (Eng) (*P.A.* **70**: 9013).
SEMELUK, G. P., STEVENS, R. D. S. and UNGER, I., "Spectrofluorometric studies; V. 1,2,4- and 1,3,5-trifluorobenzene," *Canad. J. Phys.* **47**, N 4, 597–603 (1969) (Eng).
SINGH, A. N. and SINGH, I. S., "Emission spectrum of benzyl radical," *Indian J. Pure Appl. Phys.* **7**, N 5, 349–51 (1969) (Eng).
SINGH, S. N., AMMA, R. A. and SINGH, S. N., "Near ultraviolet emission and absorption spectra of o-chlorotoluene vapour," *Indian J. Pure Appl. Phys.* **7**, N, 768–9 (1969) (Eng) (*P.A.* **70**: 17093).
SINGH, S. N. and SINGH, I. S., "Near ultraviolet emission spectrum of *m*-difluorobenzene," *Indian J. Phys.* **42**, N 1, 42–9 (1968) (Eng) (*C. A.* **69**: 72516v).

SMITH, J. J. and MEYER, B., "Fluorescence and induced phosphorescence of formaldehyde in solid low-temperature solutions," *J. Chem. Phys.* **50**, N 1, 456–9 (1969) (Eng).
TEPLITSKAYA, T. A. and PERSONOV, R. I., "Possible oxygen quenching of the luminescence of aromatic hydrocarbons in *n*-paraffins at 77-deg.-K," *Zh. Fiz. Khim.* **43**, N 7, 1679–81 (1969) (Russ).
USTYUGOVA, L. N. and NAKHIMOVSKAYA, L. A., "Effect of crystallization conditions for *n*-paraffin solutions of some aromatic compounds on their absorption and fluorescence spectra at 77-deg.-K," *Zh. Prikl. Spectrosc.* **9**, N 6, 1053–6 (1968) (Russ).
UTKINA, L. F., "Manifestation of the vibrational structure of anthracene in the spectra of some complex condensed aromatic hydrocarbons," *Zh. Prikl. Spectrosc.* **9**, N 466–9 (1968) (Russ).
ZAIDI, Z. H. and KHANNA, B. N., "Spectroscopic study of phenanthrene cation trapped in boric acid glass," *Indian J. Pure Appl. Phys.* **7**, N 11, 753–6 (1969) (Eng) (*P.A.* **70**: 17114).
ZAKIS, U. R., "Spectroscopy of molecular centers in crystal phosphors," *Izv. Akad. Nauk SSSR, Ser. Fiz.* **33**, N 6, 999–1000 (1969) (Russ).

3.7. Phosphorescence

BALDWIN, B. A. and OFFEN, H. W., "Enviromental effects of phosphorescence; IV. Triplet decay of halonaphthalenes in compressed PMMA," *J. Chem. Phys.* **49**, N 7, 2937–9 (1968) (Eng).
BATEHA, I. G., ALFIMOV, M. V. and SHEKK, Y. B., "Sensibilized with solute phosphorescence. II. Diffuse character of energy transfer to impurity," *Khim. Vys. Energ.* **3**, N 1, 48–53 (1969) (Russ).
BREUER, G. M. and LEE, E. K. C., "Fluorescence decay times of photoexcited benzene and toluene in the gas phase," *J. Chem. Phys.* **51**, N 7, 3130–2 (1969) (Eng).
BRIEGLEB, G., HERRE, W. and WOLF, D., "Triplet-singlet-$n\pi$-emission spectrum of *p*-benzoquinone in solutions, crystals and electron-donor-acceptor complexes at 180 °C," *Spectrochim. Acta* **25A**, N 1, 39–46 (1969) (Ger) (*P.A.* **69**: 31142).
CHENG, TSAI S. and ROBINSON, G. W., "Phosphorescence and the true lifetime of triplet states in fluid solutions," *J. Chem. Phys.* **49**, N 7, 3184–91 (1968) (Eng).
CHOMSE, H. and MOTZ, R., "On organic phosphors: investigation of isotopic hydrogen and deuterium systems," *Proc. Inter. Conf. Luminescence.* **1** and **2**, Budapest, 1966. Budapest, Akademiai Kiado, 400–4 (1968) (Eng) (*P.A.* **70**: 12454).
CLARK, W. D. K., LITT, A. D., and STEEL, C., "Triplet lifetimes of benzophenone, acetophenone, and triphenylene in hydrocarbons," *J. Amer. Chem. Soc.* **91**, N 19, 5413–5 (1969) (Eng).
ERLITZ, M. D. and NIEMAN, G. C., "Temperature dependence of the phosphorescence lifetime of mesitylene," *J. Chem. Phys.* **50**, N 3, 1479–80 (1969) (Eng).
GIERKE, T. D., WATTS, R. J. and STRICKLER, S. J., "Phosphorescence lifetimes of dideuteronaphthalenes," *J. Chem. Phys.* **50**, N 12, 5425–6 (1969) (Eng).
GREBENSHCHIKOV, D. M., "Temperature dependence of the fluorescence of coronene in *n*-paraffins," *Optics and Spectrosc.* **25**, N 3, 368–72 (1968) (Russ).
GREBENSHCHIKOV, D. M. and PERSONOV, R. I., "Temperature dependence of the phosphorescence of complex aromatic molecules in frozen *n*-paraffin solutions," *Optics and Spectrosc.* **26**, N 2, 264–70 (1969) (Russ).
HALL, L. ARMSTRONG, A., MOOMAW, W. and EL-SAYED, M. A., "Spin-lattice relaxation and the decay of pyrazine phosphorescence at low temperatures," *J. Chem. Phys.* **48**, N 3, 1395–6 (1968) (Eng) (*P.A.* **68**: 36535).
HANINGET, G. A. and LEE, E. K. C., "Benzene-photosensitized phosphorescence emission from biacetyl. Competitive quenching by π-bonded molecules," *J. Phys. Chem.* **73**, N 6, 1815–22 (1969) (Eng).
HELMAN, W. P., "Effect of deuteration on the fluorescent lifetime of liquid benzene," *J. Chem. Phys.* **51**, N 1, 354–7 (1969) (Eng).
HENRY, B. R. and SIEBRAND, W., "Spin-orbit coupling in aromatic hydrocarbons. Calculation of the radiative triplet lifetimes of naphthalene, anthracene, and phenanthrene," *J. Chem. Phys.* **51**, N 6, 2396–405 (1969) (Eng) (*P.A.* **70**: 17089).
JONES, P. F. and CALLOWAY, A. R., "Temperature and matrix effects on the phosphorescence lifetimes of naphthalene-d_8," *J. Chem. Phys.* **51**, N 4, 1661–2 (1969) (Eng) (*P.A.* **70**: 9037).
KISLYAK, G. M., LYSENKO, G. M. and PONOCHOVNYI, V. I., "Anti-stokes phosphorescence of organic substances," *Ukr. Fiz. Zh.* **14**, N 2, 338–40 (1969) (Russ).
LEUBNER, I. H. and HODGKINS, J. E., "Temperature dependence of the phosphorescence lifetime of benzene and *n*-alkylbenzenes between 4,2 and 100 °K," *J. Phys. Chem.* **73**, N 8, 2545–50 (1969) (Eng).
LIM, E. C., LI, R. and LI, Y. H., "Vibronic interactions between $n\pi$ and $\pi\pi$ states of polycyclic azines and aromatic aldehydes: a study of perturbing from phosphorescence spectra," *J. Chem. Phys.* **50**, N 11, 4925–33 (1969) (Eng) (*P.A.* **69**: 42426).
LUMB, M. D., BRAGA, C. L. and PEREIRA, L. C., "Emission spectra and phosphorescence lifetime of benzene solutions at 77 °K, as a function of concentration and excitation wavelength," *Trans. Faraday Soc.* **65**, pt. 8, N 560, 1992–9 (1969) (Eng) (*P.A.* **70**: 34823).
MAMEDOV, K. I. and NASIBOV, I. K., "Splitting up of the phosphorescence spectrum of frozen solutions of monohalosubstituted naphthalenes into sequences with varying lifetimes," *Izv. Akad. Nauk SSSR, Ser. Fiz.* **32**, N 9, 1508–10 (1968) (Russ).
MAMEDOV, K. I., NASIBOV, I. K. and NKYAZOVA, E. N., "Two phosphorescences with different values for the lifetimes of α-halosubstituted naphthalenes in paraffins at low temperature," *Izv. Akad. Nauk Azerb. SSR, Ser. Fiz. -Tekh. Mat. Nauk*, N 4, 7–9 (1968) (Russ).
MARTIN, T. E. and KALANTAR, A. H., "Relative phosphorescence radiative rate constants: benzene in two cyclohexane sites at 77 °K," *J. Chem. Phys.* **50**, N 3, 1486–7 (1969) (Eng) (*C.A.* **69**: 28725).
METZGER, J. L., SMITH, B. E. and MEYER, B., "Phosphorescence of matrix-isolated naphthalene and phenanthrene," *Spectrochim. Acta* **25A**, N 7, 1177–88 (1969) (Eng).
OFFEN, H. W. and HEIN, D. E., "Environmental effects on phosphorescence. VI. Matrix site effects for triphenylene," *J. Chem. Phys.* **50**, N 12, 5274–8 (1969) (Eng).
PAVLOPOULOS, T. G., "Vibronic spin-orbit interaction in the phosphorescence spectrum of phenazine," *J. Chem. Phys.* **51**, N 7, 2936–40 (1969) (Eng).
PONOCHOVNYI, V. I., LYSENKO, G. M. and KISLJAK, G. M., "About concentration dependence of phosphorescence spectra under low temperatures," *Ukr. Fiz. Zh.* **14**, N 12, 2068–70 (1969) (Russ).
RABALAIS, J. W., MARIA, H. J. and MCGLYNN, S. P., "Comments on phosphorescence decay times of benzene and methylbenzene derivatives," *Chem. Phys. Letters* **3**, N 2, 59–60 (1969) (Eng).
RABALAIS, J. W., MARIA, H. J. and MCGLYNN, S. P., "Phosphorescence decay of benzene and methylbenzene derivatives," *J. Chem. Phys.* **51**, N 5, 2259–73 (1969) (Eng) (*P.A.* **70**: 21508).

SIMPSON, J. D., OFFEN, H. W. and BURR, J. G., " Effect of partial deuteration on biphenyl phosphorescence " *Chem. Phys. Letters* **2**, N 6, 383–4 (1968) (Eng).
SMITH, J. J. and MEYER, B., " Absorption and phosphorescence spectrum of matrix-isolated ferrocene," *J. Chem. Phys.* **48**, N 12, 5436–9 (1968) (Eng).
SMITH, J. J. and MEYER, B., " Fluorescence and induced phosphorescence of formaldehyde in solid low-temperature solutions," *J. Chem. Phys.* **50**, N 1, 456–9 (1969) (Eng).
TINTI, D. S., EL-SAYED, M. A., MAKI, A. H. and HARRIS, C. B., " Phosphorescence-microwave double-resonance (PMDR) spectroscopy," *Chem. Phys. Letters* **3**, N 5, 343–6 (1969) (Eng).

3.8. Dissipation and Migration of Molecular Excitation Energy

AGABEKYAN, A. S., " Resonance energy transfer in the case of nonuniform broadening of spectra lines," *Optics and Spectrosc.* **27**, N 4, 643–8 (1969) (Russ) (*P.A.* **70**: 44808).
AGREST, M. M. and KILIN, S. F., RIKENGLAZ, M. M. and ROZMAN, I. M., "Energy transfer of electron excitation in liquid solutions," *Optics and Spectrosc.* **27**, N 6, 946–53 (1969) (Russ).
ALFIMOV, M. V., BATEKHA, I. G. and SMIRNOV, V. A., " Energy transfer from high triplet levels," *Dokl. Akad. Nauk SSSR* **185**, N 3, 626–8 (1969) (Russ).
ANDERSON, E. M. and KISTIAKOWSKY, G. B., " Fluorescence and intersystem crossing of benzene-h_6, -d_6 and -1,4-d_2," *J. Chem. Phys.* **51**, N 1, 182–8 (1969) (Eng) (*P.A.* **70**: 985)
ANDREYESHCHEV, E. A., KILIN, S. F., NOVOTNYI, I., ROZMAN, I. M. and SPURNYI, F., " Excitation energy transfer in benzene and p-xylene solutions," *Optics and Spectrosc.* **24**, N 2, 229–36 (1968) (Russ) (*C.A.* **68**: 14567b).
ANTIPENKO, B. M. and ERMOLAEV, V. L., " Mechanism of radiationless energy transfer between rare earth ions in liquid solutions," *Optics and Spectrosc.* **26**, N 5, 758–64 (1969) (Russ).
BAESSLER, H., LOELKES, G. and VAUBEL, G., " Lifetime and motion of triplet states in molten aromatic systems," *J. Chem. Phys.* **51**, N 9, 3695–701 (1969) (Eng).
BALDWIN, B. A. and OFFEN, H. W., " Environmental effects of phosphorescence. IV. Triplet decay of halonaphthalenes in compressed PMMA," *J. Chem. Phys.* **49**, N 7, 2937–9 (1968) (Eng).
BALLARD, R. E., " The transfer of electronic excitation energy from rare earth ions to water vibrations," *Spectrochim. Acta* **24A**, N 1, 65–71 (1968), (Eng).
BAUER, R., GRUDZINSKI, H., JABLONSKI, A. and LISICKI, E., " Relaxation of the local temperatures of luminescent centres in solutions," *Acta Phys. Polon.* **33**, N 5, 803–17 (1968) (Eng).
BELAVIN, A. A., ZEL'DOVICH, B. YA., PERELOMOV, A. M. and POPOV, V. S., " Relaxation of quantum systems with equidistant spectra," *Zh. Eksp. Teor. Fiz.* **56**, N 1, 264–74 (1969) (Russ) (*P.A.* **69**: 29193).
BERLMAN, I. B., GOLDSCHMIDT, C. R., TOMKIEWICZ, Y. and WEINREB, A., " Energy transfer from pyrene to perylene at high excitation intensity," *Chem. Phys. Letters* **2**, N 8, 657–8 (1968) (Eng).
BERLMAN, I. B., " Factors relevant to a short lifetime of an aromatic molecule: empirical data," *Mol. Cryst.* **4**, N 1–4, 157–63 (1968) (Eng).
BIRKS, J. B. and GEORGHIOU, S., " Energy transfer in organic systems VII. Effect of diffusion on fluorescence decay," *J. Phys. B, Proc. Phys. Soc. Ser* I, **1**, N 5, 958–65 (1968) (Eng).
BIXON, M. and JORTNER, J., " Electronic relaxation in large molecules," *J. Chem. Phys.* **50**, N 9, 4061–70 (1969) (Eng).
BIXON, M. and JORTNER, J., " Long radiative lifetimes of small molecules," *J. Chem. Phys.* **50**, N 8, 3284–90 (1969) (Eng).
BOCK, E. and TOMCHUK, E., " Molecular rotational relaxation time of aniline in deuterated benzene solution at 20 °C," *Canad. J. Chem.* **47**, N 12, 2301–3 (1969) (Eng).
BRAUN, A. M., HAMMOND, W. B. and CASSIDY, H. G., " Vibrational quenching of triplet states," *J. Amer. Chem. Soc.* **91**, N 22, 6196–8 (1969) (Eng).
BREEN, D. E. and KELLER, R. A., " Intramolecular energy transfer between triplet states of weakly interacting chromophores. I. Compounds in which the chromophores are separated by a series of methylene groups," *J. Amer. Chem. Soc.* **90** N 8, 1935–44 (1968) (Eng).
BREUER, G. M. and LEE, E. K. C., " Deuterium isotope effect in singlet→triplet radiationless transitions of benzene and benzene-d_6," *J. Chem. Phys.* **51**, N 8, 3615–16 (1969) (Eng).
BREUER, G. M. and LEE, E. K. C., " Fluorescence decay times of photoexcited benzene and toluene in the gas phase," *J. Chem. Phys.* **51**, N 7, 3130–2 (1969) (Eng).
BRINEN, J. S., ORLOFF, M. K., GALLIVAN, J. B., STAMM, R. F. and ROBERTS, B. G., " Radiative and radiationless rate constants of aromatic hydrocarbons. Chrysenes," *J. Mol. Spectrosc.* **32**, N 3, 368–74 (1969) (Eng).
BURLAND, D. M. and ROBINSON, G. W., " Calculated radiationless transition rates for benzene and deuterobenzene," *J. Chem. Phys.* **51**, N 10, 4548–59 (1969) (Eng) (*P.A.* **70**: 25111).
BURTON, C. S. and NOYES, W. A., JR., " Electronic energy relaxation in toluene vapor," *J. Chem. Phys.* **49**, N 4, 1705–14 (1968) (Eng).
CHEN, T.-H. and SCHLAG, E. W., " Direct measurement of the lifetime of benzene in its vibrationless $^1B_{3u}$ state," *Molec. Lumin., Int. Conf. 1968*, New York, W. A. Benjamin, 381–92 (1969) (Eng) (C.A. **69**: 26359q).
CHEN, T.-H., " Effect of exciting wavelength and foreign gases on fluorescence and intersystem crossing in benzene vapor," *Diss. Abstr. B* **28**, N 12, 4962 (1968) (Eng) (*C.A.* **69**: 82038e).
CLARK, W. D. K., LITT, A. D. and STREL, C., " Triplet lifetimes of benzophenone, acetophenone, and triphenylene in hydrocarbons," *J. Amer. Chem. Soc.* **91**, N 19, 5413–15 (1969) (Eng).
COCIVERA, M., " Triplet energy transfer in solution studies by MNR spectroscopy," *Chem. Phys. Letters* **2**, N 8, 529–32 (1968) (Eng).
DAWSON, W. R. and KROPP, J. L., " Radiative and radiationless processes in aromatic molecules. Coronene and benzcoronene," *J. Phys. Chem.* **73**, N 3, 693–9 (1969) (Eng).
DAWSON, W. R. and KROPP, J. L., " Radiationless deactivation and anomalous fluorescence of singlet 1, 12-benzperylene," *J. Phys. Chem.* **73**, N 6, 1752–8 (1969) (Eng).
DAWSON, W. R. and KROPP, J. L., " Radiative and radiationless processes in aromatic molecules: coronene and benzocoronene," U.S. Clearinghouse Fed. Sci. Tech. Inform., 1968. AD 672665, 24 pp. From. U.S. Govt. Res. Develop. Rep., **68**, N 19, 64 (1968) (Eng) (*C.A.* **69**: 42627k).
DOMBI, J., " Energy transfer processes in luminescent mixed solutions," *Acta Phys (Budapest)* **25**, N 3, 287–305 (1968) (Eng) (*C.A.* **69**: 72601q).
EISENTHAL, K. B., " Relative orientation of molecules involved in triplet-triplet energy transfer," *J. Chem. Phys.* **50**, N 7, 3120–2 (1969) (Eng) (*C.A.* **69**:17185c).

EL-SAYED, M. A., TINTI, D. S. and YEE, E. M., "Conservation of spin direction and production of spin alignment in triplet-triplet energy transfer," *J. Chem. Phys.* **51**, N 12, 5721–3 (1969) (Eng).
EL-SAYED, M. A., "Radiationless loss mechanism and intermolecular interactions," U.S. Clearinghouse Fed. Sci. Tech. Inform., AD 1968, AD-679239, 12 pp. Avail CFSTI. From U.S. Govt. Res. Develop. Rep. **69**, N 3, 77–8 (1969) (Eng) (*C.A.* **69**: 119849u).
ELKANA, Y., FEITELSON, J. and KATCHALSKI, E., "Effect of diffusion on transfer electronic excitation energy," *J. Chem. Phys.* **48**, N 6, 2399–404 (1968) (Eng).
ERLITZ, M. D. and NIEMAN, G. C., "Temperature dependence of the phosphorescence lifetime of mesitylene," *J. Chem. Phys.* **50**, N 3, 1479–80 (1969) (Eng).
ERMOLAEV, V. L. and TACHIN, V. S., "Mechanism of the transfer of triplet state energy of aromatic ketones to rare earth ions in liquid solutions," *Optics and Spectrosc.* **27**, N 6, 1007–9 (1969) (Russ).
FILIPESCU, N., DEMEMBER, J. R. and MINN, F. L., "Intramolecular triplet-triplet energy transfer between nonconjugated chromophores with fixed orientation," *J. Amer. Chem. Soc.* **91**, N 15, 4169–73 (1969) (Eng).
FISCHER, S., "Energy dependence of radiationless transitions," *Chem. Phys. Letters* **4**, N 6, 333–4 (1969) (Eng).
FISCHER, S. and SCHLAG, E. W., "Theory of radiationless transitions for large molecules," *Chem. Phys. Letters* **4**, N 6, 393–6 (1969) (Eng).
GALANIN, M. D., KIRSANOV, B. P. and CHIZHIKOVA, Z. A., "Quenching of the luminescence of complex molecules in a strong laser field," *Pis'ma Zh. Eksp. Teor. Fiz.* **9**, N 9, 502–7 (1969) (Russ).
GAMURAR, V. Y., PERLIN, U. E. and TSUKERBLAT, B. S., "Radiationless energy transfer in activated crystals," *Fiz. Tverd. Tela* **11**, N 5, 1193–9 (1969) (Russ).
GEORGHIOU, S., "Effect of resonance energy transfer on donor fluorescence decay: a study by the phase and modulation technique," *J. Phys. B, Proc. Phys. Soc. Ser.* 2, **2**, N10, 1084–9 (1969) (Eng).
GIERKE, T. D., WATTS, R. J. and STRICKLER, S. J., "Phosphorescence lifetimes of dideuteronaphthalenes," *J. Chem. Phys.* **50**, N 12, 5425–6 (1969) (Eng).
GOLDSCHMIDT, C. R., TOMKIEWICZ, Y. and WEINREB, A., "Influence of excimer formation on the transfer of excitation energy from pyrene to perylene," *Spectrochim. Acta* **25A**, N 8, 1471–7 (1969) (Eng) (*C.A.* **70**: 65741)
HADLEY, S. G. and KELLER, R. A., "Direct determination of the singlet→triplet intersystem crossing quantum yield naphthalene, phenanthrene and triphenylene," *J. Phys. Chem.* **73**, N 12, 4356–9 (1969) (Eng) (*P.A.* **70**: 39440).
HELMAN, W. P., "Effect of deuteration on the fluorescent lifetime of liquid benzene," *J. Chem. Phys.* **51**, N 1, 354–7 (1969) (Eng).
HENRY, B. R. and SIEBRAND, W., "Calculation of the isotope effect on the triplet lifetime of partially deuterated naphthalenes," *Chem. Phys. Letters* **3**, N 5, 327–8 (1969) (Eng).
HENRY, B. R. and SIEBRAND, W., "Spin-orbit coupling in aromatic hydrocarbons. Calculation of the radiative triplet lifetimes of naphthalene, anthracene, and phenanthrene," *J. Chem. Phys.* **51**, N 6, 2396–405 (1969) (Eng) (*P.A.* **70**: 17089)
HOLZMAN, P. and JARNAGIN, R. C., "Triplet energy migration in pure fluids," *J. Chem. Phys.* **51**, N 5, 2251–3 (1969) (Eng).
HORROCKS, D. L., "Measurement of transfer efficiencies and radiative transfer of aromatic solvents at very low solute concentrations," *Mol. Cryst.* **4**, N 1–4, 45–59 (1968) (Eng).
JORTNER, J. and BIXON, M., "Radiationless transitions in polyatomic molecules," *Israel. J. Chem.* **7**, N 2, 189–220 (1969) (Eng).
KALENOV, U. A. and YUSHCHENKOVA, N. I., "Kinetics of the vibrational relaxation CF polyatomic molecules," *Dokl. Akad. Nauk SSSR* **189**, N 5, 1041–4 (1969) (Russ).
KEARVELL, A. and WILKINSON, F., "Fluorescence quenching and external spin-orbit coupling effects," *Mol. Cryst.* **4**, N 1–4, 69–81 (1968) (Eng).
KELLER, R. A., "Intersystem crossing from excited triplet states into the singlet manifold," *Molec. Lumin., Int. Conf. 1968*, New York, W. A. Benjamin, 453–68 (1969) (Eng) (*C.A.* **69**: 44088e).
KRAMER, H. E., HAFNER, M. and ZUEGEL, M., "Energy determination of the thionine triplet by triplet-triplet energy transfer. Experiments with continuous irradiation," *Z. phys. Chem. (Frankfurt am Main)* **65**, N 5–6, 276–89 (1969) (Ger).
KROPP, J. L., DAWSON, W. R. and WINDSOR, M. W., "Radiative and radiationless processes in aromatic molecules. Pyrene," *J. Phys. Chem.* **73**, N 6, 1747–52 (1969) (Eng).
LAISAAR, A., "Effect of pressure on the luminescence decay time of molecular oxygen (1−) centers in potassium bromide," *Eesti NSV Tead. Akad. Toim., Fuus., Mat.* **11**, N 2, 238–40 (1968) (Russ).
LARSON, C. W. and RABINOVITCH, B. S., "Collisional quenching of competitive unimolecular reactions. Vibrational energy transfer," *J. Chem. Phys.* **51**, N 6, 2293–308 (1969) (Eng).
LEE, E. K. C., SCHMIDT, M. W., SHORTRIDGE, R. G. and HANINGER, G. A., JR., "Fluorescence quenching by singlet energy transfer; I. From benzene and toluene to π-bonded molecules," *J. Phys. Chem.* **73**, N 6, 1805–15 (1969) (Eng).
LEITE, M. S. S. C. and NAQVI, K. R., "Intermolecular quenching of the second excited state of some aromatic molecules," *Chem. Phys. Letters* **4**, N 1, 35–8 (1969) (Eng) (*P.A.* **70**: 3650).
LEUBNER, I. H. and HODGKINS, J. E., "Temperature dependence of the phosphorescence lifetime of benzene and n-alkylbenzenes between 4,2 and 100 °K," *J. Phys. Chem.* **73**, N 8, 2545–50 (1969) (Eng).
LEVSHIN, V. L. and GRINEVA, U. I., "Resonance transfer of activation energy between complex molecules," *Zh. Prikl. Spectrosc.* **9**, N 4, 630–6 (1968) (Russ).
MARTINEZ, A., "Electronic energy transfer from the triplet state of organic molecules in frozen solutions at 77 °K," *J. Chim. Phys. (France)* **65**, N 7–8, 1431–9 (1968) (Fr) (*P.A.* **69**: 17488).
MARTINEZ, A. and DORIGNAC, D., "Changements in solvent structure and luminescence of rigid solutions (T-S emission and delayed fluorescence)," *J. Chim. Phys. (France)* **66**, N 5, 817–24 (1969) (Fr).
MARTIN, T. E. and KALANTAR, A. H., "Radiationless processes of alkyl aromatic triplet states at 77 °K: the unimportance of alkyl hydrogens," *Chem. Phys. Letters* **4**, N 5, 235–8 (1969) (Eng).
MARTINEZ, A., "Transfer of electronic energy between molecules of different multiplicity," *J. Chim. Phys. (France)* **65**, N 9, 1663–4 (1968) (Fr) (*C.A.* **69**: 30076)
MASHKEVICH, V. S., "Phenomenological theory of the quantum dissipative systems," *Ukr. Fiz. Zh.* **14**, N 8, 1289–97 (1969) (Ukr) (*P.A.* **70**: 315).
MATAGA, N., OBASHI, H. and OKADA, T., "Electronic excitation transfer from pyrene to perylene by a very weak interaction mechanism." *J. Phys. Chem.* **73**, N 2, 370–4 (1969) (Eng).
MELHUISH, W. H., "Low-energy triplet-triplet transitions in naphthalene and some monosubstituted derivatives," *J. Chem. Phys.* **50**, N 6, 2779–81 (1969) (Eng) (*P.A.* **70**: 65750).

MORANTZ, D. J. and MARTIN, T. E., " Environmental effects on triplet lifetimes of some aromatic hydrocarbons at 77 °K," *Trans. Faraday Soc.* **65**, N 555, pt. 3, 665–72 (1969) (Eng).
MORIKAWA, A. and CVETANOVIĆ, R. J., "Quenching of the excited singlet state of benzene ($^1B_{2u}$) by monoolefins and diolefins," *J. Chem. Phys.* **49**, N 3, 1214-20 (1968) (Eng).
OHNO, T. and KATO, S., " Energy transfer from the triplet excited states of aromatic molecules to chromium (III) complexes," *Bull. Chem. Soc. Jap.* **42**, N 12, 3385–89 (1969) (Eng).
OVCHINNIKOV, A. A. and OVCHINNIKOVA, M. Y., " Radiationless transition with charge transfer in a polar medium," *Dokl. Akad. Nauk SSSR* **186**, N 1, 76–7 (1969) (Russ).
OVCHINNIKOVA, M. Y., " Estimate of Franck-Condon factors for radiationless singlet-triplet transitions in aromatic molecules," *Teor. Eksp. Khim.* **4**, N 5 575–82 (1968) (Russ).
PARMENTER, C. S. and RAU, J. D., " Fluorescence quenching in aromatic hydrocarbons by oxygen," *J. Chem. Phys.* **51**, N 5, 2242–6 (1969) (Eng) (*P.A.* **70**: 14281).
PEARLSTEIN, R. M., " Donor fluorescence as a probe of energy transfer," *Photochem. Photobiol.* **8**, N 5, 341–7 (1968) (Eng).
RABALAIS, J. W., MARIA, H. J. and MCGLYNN, S. P., " Comments on phosphorescence decay times of benzene and methylbenzene derivatives," *Chem. Phys. Letters* **3**, N 2, 56–60 (1969) (Eng).
RAPP, D. and KASSAL, T., " The theory of vibrational energy transfer between simple molecules in nonreactive collisions," *Chem. Rev.* **69**, N 1, 61–102 (1969) (Eng).
REBANE, K. and SAARI, P., " Decay time of a nitrite impurity local vibrational quantum into phonons in a potassium chloride crystal," *Eest. NSV Tead. Akad. Toim., Fuus., Mat.* **11**, N 2, 241–4 (1968) (Russ).
SCHLAG, E. W., YAO, S. J. and VON WEYSSENHOFF, H., " Relaxation theory for modulation excitation of vibronic states," *Chem. Phys.* **50**, N 2, 732–6 (1969) (Eng) (*C.A.* **69**: 72562e).
SCHULTE-FROHLINDE, D. and PFEFFERKORN, R., " Intermolecular fluorescence quenching of substituted naphthalene derivatives induced by charge transfer processes," *Ber. Bunsenges. Phys. Chem.* **72**, N 2, 330–4 (1968) (Eng) (*P.A.* **69**: 20972).
SIEGEL, S. and GOLDSTEIN, L., " Study of T→T transfer by the method of magnetophotoselection. I. Transfer between unlike molecules," *J. Chem. Phys.* **43**, N 11, 4185–7 (1965) (Eng).
SHIN, H. K., " Vibration-vibration energy transfer between diatomic molecules," *Chem. Phys. Letters* **3**, N 7, 560–4 (1969) (Eng).
TERSKOI, Y. A., BRUDZ, V. G. and KOROLKOVA, O. N., " Transfer of the electron excitation energy in solid solutions of organic luminophors," *Optics and Spectrosc.* **25**, N 4, 516–22 (1968) (Russ).
TOMURA, M., ISHIGURO, E. and MATAGA, N., " Energy transfer by resonance between organic molecules in solution," *J. Phys. Soc. Jap.* **25**, N 5, 1439–46 (1968) (Eng).
TRIFONOV, E. D. and SHEKHTMAN, V. L., " Theory of nonradiative transitions," *Fiz. Tverd. Tela* **11**, N 10, 2984-91 (1969) (Russ) (*P.A.* **70**: 31656).
VARKONYI, Z., " Influence of diffusion on the energy migration in mixed solutions," *Acta Phys. et Chem.* **15**, N 1–2, 19–26 (1969) (Eng).
VASIL'EV, I. V., ZVEREV, G. M., KOLODNYI, G. Y. and ONISHCHENKO, A. M., " Non-resonance excitation energy transfer between impurity rare earth ions," *Zh. Eksp. Teor. Fiz.* **56**, N 1, 122–33 (1969) (Russ).
VIEROSANU, J. " On the mechanism of the concentration quenching of fluorescence," *Proc. Int. Conf. Luminescence*, Budapest, 1966; **1**, Budapest Akademiai Kiado, 462–7 (1968) (Eng) (*P.A.* **70**: 11366).
VON WEYSSENHOFF, H., SCHLAG, E. W. and STARZAK, M., " Vibrational energy transfer in inelastic collisions of vibronic states," *Ber. Bunsenges, Phys. Chem.* **72**, N 2, 155–6 (Eng) (*P.A.* **69**: 15910).
WAGNER, O. E., CHRISTOPHOROU, L. G. and CARTER, J. G., " Lifetimes of liquid benzene, toluene, and mesitylene excited by a pulsed-electron beam," *Chem. Phys. Letters* **4**, N 4, 224 (1969) (Eng).
WAGNER, P. J. and KOCHEVAR, I., " How efficient in diffusion-controlled triplet energy transfer," *J. Amer. Chem. Soc.* **90**, N 9, 2232–8 (1968) (Eng).
WARWICK, D. A. and WELLS, C. H. J., " Perturbation of singlet-triplet transitions in aromatic carbonyl compounds," *Spectrochim. Acta* **24A** N 5, 589–93 (1968) (Eng) (*C.A.* **68**: 118301f).
YANG, N. C., MUROV, S. L. and SHIEH, T. C., " Radiationless decay processes in 2-naphthaldehyde," *Chem. Phys. Letters* **3**, N 1, 6–8 (1969) (Eng).
YGUERABIDE, J., " Behavior of excited molecules of aromatic hydrocarbons in the liquid state. II. Benzene and p-xylene quenching by O_2 and CCl_4," *J. Chem. Phys.* **49**, N 3, 1026–31 (1968) (Eng).
YILDIZ, A. and REILLEY, C. N., " Mechanism of intersystem crossing for some substituted aromatic hydrocarbons," *Spectrosc. Letters* **1**, N 8–9, 335–43 (1968) (Eng) (*C.A.* **69**: 72584m).

3.9. Stimulated Emission and Light Generation

ABAKUMOV, G. A., SIMONOV, A. P., FADEEV, V. V., KHARITONOV, L. A. and KHOKHLOV, R. V., " Ultraviolet laser generation in organic scintillator molecules," *Pis'ma Zh. Eksp. Teor. Fiz*, **9**, N 1, 15–18 (1969) (Russ).
ARISTOV, A. V. and MASLYUKOV, U.S., " Criteria for the generation threshold in solutions of organo luminophors during pulse lamp excitation," *Optics and Spectrosc.* **26**, N 5, 867–9 (1969) (Russ).
ARISTOV, A. V., KOZLOVSKII, D. A. and MASLYUKOV, U.S., " Effect of some fluorescence quenchers on the threshold of the laser effect in organic luminophors," *Optics and Spectrosc.* **27**, N 6, 1009–11 (1969) (Russ).
BELAN, V. R., GRIGORYANTS, V. V. and ZHABOTINSKII, M. E., " Fluorescence method for determining laser parameters," *Opto-electronics* **1**, N 1, 33–5 (1969) (Eng).
BRADLEY, D. J., GALE, G. M., MOORE, M. and SMITH, P. D., " Longitudinally pumped, narrow-band continuously tunable dye laser," *Phys. Letters* **26A**, N 8, 378–9 (1968) (Eng).
DERKACHEVA, L. D. and KRYMOVA, A. I., " Four-photon resonant parametric interaction in lasers using dye solutions," *Pis'ma Zh. Eksp. Teor. Fiz.* **9**, N 10, 564–7 (Russ) (*P.A.* **69**: 48001).
DYADYUSHA, G. G., TIKHONOV, E. A. and SHPAK, M. T., " Light generation by liquid solutions of organic dyes," *Ukr. Fiz. Zh.* **13**, N 9 1529–37 (1968) (Russ).
DZHIDZHOEV, M. S., PIMENOV, M. I., PLATONENKO, V. G., FILIPPOV, U. V. and KHOKHLOV, R. V., " Creation of population inversion in polyatomic molecules at the expense of the energy of chemical reactions," *Zh. Eksp. Teor. Fiz.* **57**, N 2, 411–20 (1969) (Russ).
DZYUBENKO, M. I., NAUMENKO, I. G., CHERNYUK, I. N. and PILYUGIN, G. T., " Ruby laser frequency conversion by polymethyn dyes," *Ukr. Fiz. Zh.* **14**, N 5, 735–40 (1969) (Ukr). (*P.A.* **69**: 34171).
EISENTHAL K. B., DOWLEY, M. W. and PETICOLAS, W. L., " Two-photon spectrum of a liquid," *Phys. Rev. Letters* **20**, N 3, 93–5 (1968) (Eng) (*C.A.* **69**: 118226k).
FARMER, G., " Comment on time-resolved spectra of organic dye lasers," *Int. J. Quantum Chem.* **3**, pt. 1, N 3 Symposium, p. 327 (1969) (Eng).

FARMER, G. I., HUTH, B. G., TAYLOR, L. M. and KAGAN, M. R., " Time-resolved stimulated emission spectra of an organic dye laser," *Appl. Phys. Letters* **12**, N 4, 136–8 (1968) (Eng).
GALANIN, M. D., KIRSANOV, B. P. and CHIZHIKOVA, Z. A., " Quenching of the luminescence of complex molecules in a strong laser field," *Pis'ma Zh. Eksp. Teor. Fiz.* **9**, N 9, 502–7 (1969) (Russ).
GLENN, W. H., BRIENZA, M. J. and DEMARIA, A. J., " Mode locking of an organic dye laser," *Appl Phys. Letters* **12**, N 2, 54–6 (1968) (Eng).
GREGG, D. W. and THOMAS, S. J., " New lasing organic dyes flashlamp-pumped," *IEEE J. Quantum Electronics* **QE-5**, N 6, 302 (1969) (Eng) (*P.A.* **69**: 45960).
KATZENSTEIN, J., MAGYAR, G. and SELDEN, A. C., " Laser-Q-switching by organic solvents," *Optoelectronics* **1**, N 1, 13–19 (1969) (Eng).
MULLER, A. and SOMMER, U., " The study of excited states of aromatic hydrocarbons using a laser spectrophotometer," *Ber. Bunsenges. Phys. Chem.* **73**, N 8-9, 819–26 (1969) (Ger) (*P.A.* **70**: 30246).
PEKAR, S. I., " High pressure chemical lasers and light stimulated chemical reactions," *Dokl. Akad. Nauk SSSR* **187**, N 3, 555–7 (1969) (Russ).
PETERSON, O. G., MCCOLGIN, W. C. and EBERLY, J. H., " Triplet state effects in dye lasers at threshold," *Phys. Letters* **29A**, N 7, 399–400 (1969) (Eng).
SCHÄFER, F. P., SCHMIDT, W., VOLZE, J. and MARTH, K., " Organic dye lasers," *Ber. Bunsenges. Phys. Chem.* **72**, N 2, 328–9 (1968) (Eng).
SCHAPPERT, G. T., BILLMAN, K. W. and BURNHAM, D. C., " Temperature tuning of an organic dye laser,', *Appl. Phys. Letters* **13**, N 4, 124–5 (1968) (Eng).
SEVCHENKO, A. N., KOVALEV, A. A., PILIPOVICH, V. A. and RAZVIN, U. V., " Polarized radiation induced by the generation of organic dye solutions," *Dokl. Akad. Nauk SSSR* **179**, N 3, 562–5 (1968) (Russ).
STEPANOV, B. F. and RUBINOV, A. N., " Optical quantum generators on organic dye solutions," *Usp. Fiz. Nauk* **95**, N 1, 45–74 (1968) (Russ).
TIKHONOV, E. A. and SHPAK, M. T., " Generation of light by systems of liquid solutions of organic dyes during negative absorption on activator molecules and during induced Raman effect on matrix molecules," *Zh. Prikl. Spectr.* **9**, N 5, 784 (1968) (Russ).

3.10. Spectroscopy of Photochemical Reactions

BABENKO, S. D., BENDERSKII, V. A. and GOL'DANSKII, V. I., " Photoionization of singlet molecular excitations in solutions of aromatic hydrocarbons," *Pis'ma Zh. Eksp. Teor. Fiz.* **10**, N 5, 205–9 (1969) (Russ).
BARD, A. J., SANTHANAM, K. S. V., MALOY, J. T., PHELPS, J. and WHEELER, L. O., " Steric effects and the electrochemistry of phenylsubstituted anthracene and related compounds," *Disc. Faraday Soc.* N 45, 167–74 (1968) (Eng).
BATEHA, I. G., ALFIMOV, M. V. and SHEKE, J. B., " About mechanism of formation of triplet molecule under radiolysis," *Khim. Vys. Energ.* **3**, N 3, 282–3 (1969) (Russ).
BECKER, R. S., DOLAN, E. and BALKE, D. E., " Vibronic effects in photochemistry-competition between internal conversion and photochemistry," *J. Chem. Phys.* **50**, N 1, 239–45 (1969) (Eng).
COOPER, R. and THOMAS, J. K., " Formation of excited states in the nanosecond-pulse radiolysis of solutions of benzene and toluene," *J. Chem. Phys.* **48**, N 11, 5097–102 (1968) (Eng).
DONCKT, E. V., DRAMAIX, R., NASIELSKI, J. and VOGELS, C., " Photochemistry of aromatic compounds. Part 1, Acid-base properties of singlet and triplet excited states of pyrene derivatives and aza-aromatic compounds," *Trans. Faraday Soc.* **65**, N 564, pt. 12, 3258–62 (1969) (Eng).
DZHIDZHOEV, M. S., PIMENOV, M. I., PLATONENKO, V. G., FILIPPOV, U. V. and KHOKHLOV, R. V., " Creation of population inversion in polyatomic molecules at the expense of the energy of chemical reactions," *Zh. Eksp. Teor. Fiz.* **57**, N 2, 411–20 (1969) (Russ).
ERSHOV, U. A., KUZINA, S. I. and NEIMAN, M. B., " Mechanism of light aging and stabilization of polymers," *Usp. Khim.* **38**, N 2, 289–320 (1969) (Russ).
FISCHER, E., FISCHER, G. and STEIN, G., " Temperature dependence of radiation induced trans→cis isomerization of stilbene in toluene," *Chem. Phys. Letters* **2**, N 6, 405–6 (1968) (Eng).
GEGIOU, D., MUSZKAT, K. A. and FISCHER, E., " Temperature dependence of photoisomerization. V. The effect of stilbenes and azobenzenes," *J. Amer. Chem. Soc.* **90**, N 15, 3907–18 (1968) (Eng).
HANINGET, G. A. and LEE, E. K. C., " Benzene-photosensitized phosphorescence emission from biacetyl. Competitive quenching by π-bonded molecules," *J. Phys. Chem.* **73**, N 6, 1815–22 (1969) (Eng).
HUNZIKER, H. E., " Formation of triplet naphthalene by energy transfer from $Hg(6^3P_0)$ atoms, observed by a modulation technique," *Chem. Phys. Letters* **3**, N 7, 504–7 (1969) (Eng) (*P.A.* **70**: 7016).
JOHNSON, G. R. A. and SAUER, M. C., JR., " Pulse radiolysis study of the formation of triplet excited states of naphthalene, anthracene, and biphenyl in cyclohexane vapor," *J. Chem. Phys.* **51**, N 2, 496–501 (1969) (Eng).
KEARNS, D., KHAN, A. U., DUNCAN, C. K. and MAKI, A. H., " Detection of the naphthalene-photosensitized generation of singlet ($^1\Delta_g$) oxygen by paramagnetic resonance spectroscopy," *J. Amer. Chem. Soc.* **91**, N 4, 1039–40 (1969) (Eng).
KEMP, T. J. and ROBERTS, J. P., " Yields of excited states in the pulse radiolysis of solutions of substituted anthracenes," *Trans. Faraday Soc.* **65**, N 555, pt. 3, 725–31 (1969) (Eng).
KHOLMOGOROV, V. E., " Electron paramagnetic resonance method for studying the phototransfer of an electron and sensitized photochemical reactions," *Usp. Khim.* **38**, N 2, 321–50 (1969) (Russ).
KROH, J. and HANKIEWICZ, E., " Radiation and photochemically induced tritium substitution in aromatic hydrocarbons," *Chem. Phys. Letters* **1**, N 11, 542–4 (1968) (Eng).
MALBIN, M. D. and MARK, H. B., JR., " The electrochemiluminescence of the diphenylanthracene radical anion," *J. Phys. Chem.* **73**, N 8, 2786–7 (1969) (Eng).
NURMUKHAMETOV, R. N., PISKUNOV, A. K. and SHIGORIN, D. N., " Molecular structure and initiation of a photochemical reaction with participation of the triplet state," *Zh. Fiz. Khim.* **43**, N 5, 1177–84 (1969) (Russ).
PANKRATOV, A. A. and PRUDNIKOV, I. M., " Photoactivation of aromatic molecules on a magnesium oxide surface," *Teor. Eksp. Khim.* **5**, N 1, 107–14 (1969) (Russ).
PLOTNIKOV, V. G., " Electron state of molecules and their photochemical decomposition in the condensed phase. Decomposition of hydrocarbons on radicals," *Optics and Spectrosc.* **27**, N 4, 593–600 (1969) (Russ).

ROZENSHTEIN, L. D., SINITSKII, V. V. and VIDADI, U. A., " Nature of the photodipole effect in organic dyes," *Fiz. Techn. Poluprov.* **3**, N 1, 118–20 (1969) (Russ).
SINGH, S. and SANDORFY, C., " The electronic spectrum of the photodimer on benzo(a) anthracene," *Chem. Phys. Letters* **2**, N 7, 507–8 (1968) (Eng) (*P.A.* **69**: 13381).
WARD, H. R. and WISHNOK, J. S., " The vacuum ultraviolet photolysis of benzene," *J. Amer. Chem. Soc* **90**, N 20, 5353–7 (1968) (Eng).
WILAIRAT, P. and SELINGER, B., " The photoassociation of some substituted naphthalenes. II. The photodimers of naphthol ethers," *Aust. J. Chem.* **21**, N 3, 733–46 (1968) (Eng).
WINDSOR, M. W. and DAWSON, W. B., " Quantum efficiencies of triplet formation in aromatic molecules," *Mol. Cryst.* **4**, 1–4, 253–8 (1968) (Eng) (*P.A.* **69**: 16438).
ZHURAVLYOVA, T. S., " Determination of triplet-triplet absorption spectra by means of two quantum photosensitized reactions," *Optics and Spectrosc.* **25**, N 5, 698–700 (1968) (Russ).

3.11. Spectroscopy of Intermolecular Interaction

ARKHANZEL'SKAYA, O. I., GIRIN, O. P. and BAKHSHIEV, N. G., " Effect of intermolecular interactions of the vibrational spectra of molecules. Infrared spectra of hydrogen halides," *Optics and Spectrosc.* **27**, N 4, 778–83 (1969) (Russ) (*P.A.* **70**: 43112).
BAKHSHIEV, N. G. and ZABIYAKIN, U. E., " Intermolecular effects on the vibrational spectra of molecules. VII. On the fluctuation mechanism for the broadening of the IR absorption bands of molecules in liquids and solutions," *Optics and Spectrosc.* **27**, N 4, 607–14 (1969) (Russ) (*P.A.* **70**: 43047).
BAKHSHIEV, N. G. and ALTAISKAYA, A. V., " Intermolecular interactions and spectra of molecules in multicomponent solutions. Use of model representations for describing the features of the molecular structure and dielectric properties of liquid multicomponent systems," *Optics and Spectrosc.* **26**, N 6, 950–5 (1969) (Russ).
BAKHSHIEV, N. G., " Universal intermolecular interactions and their effect on the position of the electronic spectra of molecules in two-component solutions. XV. On the relationship among various types of intermolecular interactions," *Optics and Spectrosc.* **27**, N 1, 42–9 (1969) (Russ) (*P.A.* **70**: 43453).
BERLMAN, I. B., " Evidence of intramolecular hydrogen bonding from spectroscopic data," *Chem. Phys. Letters* **3**, N 2, 61–3 (1969) (Eng).
EL-SAYED, M. A., " Radiationless loss mechanism and intermolecular interactions," U.S. Clearinghouse Frd. Sci. Tech. Inform., AD 1968, AD-679239, 12 pp. Avail. CFSTI. From U.S. Govt. Res. Develop. Rep. **69**, N 3, 77–8 (1969) (Eng) (*C.A.* **69**: 119849u).
FRENKEL, S. F., BARANOV, V. G., GINZBURG, B. M. and ELIASHEVICH, G. K., " Specific interactions between polymer and solvent during crystallization and the formation of super molecular order," *Dokl. Akad. Nauk SSSR* **179**, N 5, 1155–8 (1968) (Russ).
HORROCKS, D. L., " Effect of solvent on excimer fluorescence yields," *J. Chem. Phys.* **51**, N 12, 5443–8 (1969) (Eng).
MORANTZ, D. J. and MARTIN, T. E., " Environmental effects on triplet lifetimes of some aromatic hydrocarbons at 77 °K," *Trans. Faraday Soc.* **65**, N 555, pt. 3, 665–72 (Eng).
NIKOLAENKO, P. T. and ARTAMONOV, A. A., " Investigation of the intermolecular dynamics of the condensed states of a body by the vibrational spectroscopy method. II. Analysis of possible changes, in intermolecular spectra during the liquid-solid phase transition," *Izv. Vyssh. Ucheb. Zaved., Fiz.* **11** N 2, 153–5 (1969) (Russ) (*P.A.* **69**: 44386).
OFFEN, H. W. and HEIN, D. E., " Environmental effects on phosphorescence. VI. Matrix site effects for triphenylene," *J. Chem. Phys.* **50**, N 12, 5274–8 (1969) (Eng).
SHIMONAEV, G. S., " Maximum energy of the intermolecular attraction of unsaturated and cyclic hydrocarbons," *Zh. Fiz. Khim.* **42**, N 8, 1895–8 (1968) (Russ).
TROMBETTI, A. and ZAULI, C., " The $^1B_{2u} \rightarrow {}^1A_{1g}$ transition of benzene and some deuterated benzenes: solvent and temperature effects," *J. Chem. Soc. B*, N 12, 1574–7 (1968) (Eng).
WILLIAMS, M. W., MACRAE, R. A., HAMM, R. N. and ARAKAWA, E. T., " Collective oscillations in pure liquid benzene," *Phys. Rev. Letters* **22**, N 21, 1088–91 (1969) (Eng).
YGUERABIDE, J., " Behavior of excited molecules of aromatic hydrocarbons in the liquid state. I. Benzene and p-xylene: aggregation effects," *J. Chem. Phys.* **49**, N 3, 1018–25 (1968) (Eng) (*C.A.* **69**: 91588m).
YGUERABIDE, J., " Behavior of excited molecules of aromatic hydrocarbons in the liquid state. II. Benzene and p-xylene quenching by O_2 and CCl_4," *J. Chem. Phys.* **49**, N 3, 1026–31 (1968) (Eng).
ZHIZHIN, G. N., MOSKALEVA, M. A. and STERIN, K. E., " Spectroscopic observance of phase transformations of cyclohexane in the presence of an impurity," *Zh. Strukt. Khim.* **10**, N 1, 52–5 (1969) (Russ).

3.12. NMR Studies

AGRAWAL, V. D., SINGH, B. K. P. N. and GUPTA, R. C., " Study of molecular orientations of 1,5-dimethylnaphthalene from NMR investigations," *Indian J. Pure Appl. Phys.* **7**, N 11, 740–2 (1969) (Eng) (*P.A.* **70**: 18782).
ALLEN, P. S. and COWKING, A., " Nuclear magnetic resonance study of hindered rotations in some methylbenzenes," *J. Chem. Phys.* **49**, N 2, 789–97 (1968) (Eng).
ALLEN, P. S. and COWKING, A., " Nuclear magnetic resonance study of molecular motions in hexamethylbenzene," *J. Chem. Phys.* **47**, N 11, 4286–9 (1968) (Eng).
BOUTIN, H. and YIP, S., *Molecular spectroscopy with neutrons*, Cambridge (Mass.)–London, MIT (Massachusetts Inst. of technology), cop. 1968, XVII, 226 pp. (Eng).
CHIBA, TAKEHIKO, " NMR of organic crystals," *Kagaku No Ryoiki* **23**, N 1, 24–9 (1969) (Japan) (*C.A.* **69**: 26105d).
COCIVERA, M., " Triplet energy transfer in solution studies by NMR spectroscopy," *Chem. Phys. Letters* **2**, N 8, 529–32 (1968) (Eng).
DIEHL, P. and KHETRAPAL, C. L., " Study of isotopic effects and determination of the quadrupole coupling constant from the nuclear magnetic resonance spectra of monodeuterobenzene in a nematic phase," *Canad. J. Chem.* **47**, N 8, 1411–6 (1969) (Eng).
EL SAFFAR, Z. M., EADES, R. G. and LLEWELLYN, J. P., " NMR study of molecular motions and phase transitions in cyclohexane," *J. Chem. Phys.* **50**, N 8, 3462–6 (1969) (Eng).
GOLDSCHMIDT, C. R., TOMKIEWICZ, Y. and BERLMAN, I. B., " An intermolecular interaction of excited state in crystals and liquids," *Chem. Phys. Letters* **2**, N 8, 520–2 (1968) (Eng).

HAYAMIZU, K. and YAMAMOTO, O., " The analysis of the proton magnetic resonance spectra of mono-substituted benzenes. Alkylbenzenes and an empirical interpretation of the ring proton chemical shifts," *J. Mol. Spectrosc.* **29**, N 2, 183–93 (1968) (Eng).
HAYAMIZU, K. and YAMAMOTO, O., " The analysis of the proton magnetic resonance spectra of mono-substituted benzenes. The ring proton chemical shifts at infinite dilution," *J. Mol. Spectrosc.* **28**, N 1, 89–100 (1968) (Eng).
LAWLER, R. G. and RISTAGNO, C. V., " Nuclear magnetic resonance spectra of the dianions of anthracene and other polynuclear aromatic hydrocarbons," *J. Amer. Chem. Soc.* **91**, N 6, 1534–5 (1969) (Eng) (*P.A.* **70**: 14279).
MOONEY, E. F., Ed., " Annual review of NMR spectroscopy," 1. London and New York, " Academic Press," (1968).
ROARK, J. L. and SMITH, W. B., " The nuclear magnetic resonance spectra of six ortho-substituted fluorobenzenes," *J. Phys. Chem.* **73**, N 4, 1046–9 (1969) (Eng) (*P.A.* **70**: 25132).
WILLIAMS, W. G., " The measurement of electron exchange rate constants using NMR: the p-benzoquinone and duroquinone parent molecule-radical anion electron exchange rate constants in solution," *Mol. Phys.* **16**, N 1, 69–75 (1969) (Eng).
YIM, C. T. and GILSON, D. F. R., " Nuclear magnetic resonance spectra of ortho-, meta-, and para-difluorobenzenes in a nematic liquid crystal solvent," *Canad. J. Chem.* **47**, N 6, 1057–65 (1969) (Eng).

4. Absorption and Luminescence Spectra of Intermolecular Complexes

4.1. Charge-transfer Complexes

AIHARA, J. -i., TSUDA, M. and INOKUCHI, H., " Solvent effects of charge-transfer complexes," *Bull. Chem. Soc. Jap.* **42**, N 7, 1824–30 (1969) (Eng).
AMANO, T., KURODA, H. and AKAMATU, H., " The charge-transfer bands in the crystal spectra of molecular compounds of tetramethylbenzidine and those of benzidine," *Bull. Chem. Soc. Jap.* **42**, N 3, 671–6 (1969) (Eng).
BATLEY, M. and LYONS, L. E., " Photoelectric emission from donor-acceptor solids and donor molecules. *Mol. Cryst.* **3**, N 3, 357–74 (1968) (Eng).
BEAUMONT, T. G. and DAVIS, K. M. C., " Charge-transfer complexes. VII. Solvent-induced changes in the spectra of Wurster's cations," *J. Chem. Soc. B*, N 5, 575–8 (1969) (Eng).
BEAUMONT, T. G. and DAVIS, K. M. C., " Multiple charge transfer bands in complexes of hexafluorobenzene with aromatic amines," *Nature* **218**, N 5144, 865 (1968) (Eng).
BEENS, H. and WELLER, A., " Characteristics of molecular complexes in the excited state," *Acta Phys. Polon.* **34**, N 4, 593–602 (1968) (Eng) (*P.A.* **70**: 15844).
BEENS, H. and WELLER, A., " Classification and formation of charge-transfer complexes in the triplet state," *Molec. Lumin., Int. Conf.* 1968, New York, W. A. Benjamin, 203–17 (1969) (Eng) (*C.A.* **69**: 26326b).
BENT, H. A., " Structural chemistry of donor-acceptor interactions," *Chem. Rev*, **68**, N 5, 588–648 (1968) (Eng).
BHAT, S. N. and RAO, C. N. R., " Semiconduction in charge-transfer complexes." *Canad. J. Chem.* **47**, N 20, 3899–902 (1969) (Eng).
BIRD, B. D. and DAY, P., " Analysis of the charge-transfer spectra of some first-transition-series tetrahalide complexes," *J. Chem. Phys.* **49**, N 1, 392–403 (1968) (Eng) (*P.A.* **69**: 1764).
BOSNICH, B., " The application of exciton theory to the determination of the absolute configurations of inorganic complexes," *Accounts of Chemical Research* **2**, N 9, 266–73 (Eng).
BRIEGLEB, G., SCHUSTER, H. and HERRE. W.," Triplet excimers favoured by charge transfer in electron-donor-acceptor-complexes," *Chem. Phys. Letters* **4**, N 2, 53–8 (Eng) (*P.A.* **70**: 9183).
BRIEGLEB, G. HERRE, W. and WOLF, D., " Triplet-singlet-$n\pi$ emission spectrum of p-benzoquinone in solutions, crystals and electron-donor acceptor complexes at 180 °C," *Spectrochim. Acta* **25A**, N 1, 39–46 (1969) (Ger) (*P.A.* **69**: 31142).
BRIEGLEB, G., BETZ, G. and HERRE, W., " Charge transfer fluorescence and phosphorescence of electron donor-acceptor complexes of organic cations with aromatic hydrocarbons," *J. Phys. Chem. (Frankfurt am Main)* **64**, N 1–4, 85–96 (1969) (Ger).
CHAKRABARTI, B. and BASU, S., " Crystal spectra of anthracene and pyrene complexes of tetra-halo p-benzoquinone," *J. Chim. Phys. (France)* **65**, N 6, 1006–8 (1968) (Fr).
CHESNUT, D. B. and MOSELEY, R. W., " The geometries of molecular complexes: an extended Hückel approach," *Theor. Chim. Acta* **13**, N 3, 230–48 (1969) (Eng).
DANTZLER, E. M. and KNOBLER, C. M., " Complex formation in benzene-hexafluorobenzene vapor mixtures," *J. Phys. Chem.* **73**, N 5, 1602–4 (1969) (Eng).
DAVIS, K. M. C. and FARMER, M. F., " Charge-transfer complexes. V. Nature of the interactions of halogenomethanes and aromatic hydrocarbons," *J. Chem. Soc. B*, N 8, 859–62 (1968) (Eng).
EREMENKO, A. M., SHEKA, E. F., PIONTKOVSKAYA, M. A. and NEIMARK, I. E., " Luminescence spectra and adsorption properties of naphthalene on different metal substituted forms of zeolite by type X," *Teor. Eksp. Khim.* **5**, N 2, 242–7 (Russ).
EWALD, A. H., " Effect of pressure on charge-transfer complexes in solution," *Trans. Faraday Soc.* **64**, N 543, pt. 3, 733–43 (1968) (Eng).
FLURRY, R. L., JR., " Molecular orbital theory of electron donor-acceptor complexes. II. Charged donors and acceptors," *J. Phys. Chem.* **73**, N 7, 2111–17 (1969) (Eng).
FULTON, A. and LYONS, L. E., " Charge-transfer complexes of purines and purimidines," *Aust. J. Chem.* **21**, N 2, 419–23 (1968) (Eng).
GALPERINA, N. I., BERENFELD, V. M., BAZOV, V. P. and KRONGAUZ, V. A., " Influence of the charge-transfer state on the optical properties of substituted benzenes," *Optics and Spectrosc.* **25**, N 2, 216–21 (1968) (Russ).
GUR'YANOVA, E. N., " Formation of donor-acceptor complexes," *Usp. Khim.* **37**, N 11, 1981–2002 (1968) (Russ).
HAYASHI, H., IWATA, S. and NAGAKURA, S., " ESR spectra of the charge-transfer triplet states of some molecular complexes," *J. Chem. Phys.* **50**, N 2, 993–1000 (1969) (Eng)(*P. A.* 69:23158)
HIBMA, T., VEGTER, J. G. and KOMMANDEUR, J., " Photoemission of some organic donor-acceptor complexes," *J. Chem. Phys.* **49**, N 11, 4755–7 (1968) (Eng).

HILLIER, I. H. and CANADINE, R. M., " Approximate molecular orbital calculations on metallo-organic complexes," *Disc. Faraday Soc.*, N 47, 27–35 (1969) (Eng) (*P.A.* **70**: 30247).
HIROOKA, T., KOCHI, M., AIHARA, J.-i., INOKUCHI, H. and HARADA, Y., " Photoemission from polycyclic aromatic crystals in the vacuum ultraviolet region. III. Aromatic crystals and charge-transfer complexes," *Bull. Chem. Soc. Jap.* (1969) **42**, N 6, 1481–89 (Eng).
HOMER, J. and COOKE, M. C., " Molecular complexes. IV. Further investigations of the mechanism of complex formation of aliphatic with aromatic molecules," *J. Chem. Soc. A*, N 13, 1984–6 (1969) (Eng).
HULME, R. and SZYMANSKI, J. T., " The crystal structure of the 2:1 complex between antimony trichloride and naphthalene," *Acta Cryst.* **25B**, N 4, 753–61 (1969) (Eng).
HUONG, P. V., PLATZER, N. and JOSIEN, M. L., " Solvent effects on the iodine-pyridine charge-transfer complex," *J. Amer. Chem. Soc.* **91**, N 13, 3669–70 (1969) (Eng).
JULIEN, L. M. and PERSON, W. R., " Contact charge-transfer spectra of iodine in some hydrocarbons solvents," *J. Phys. Chem.* **72**, N 8, 3059–61 (1968) (Eng) (*C.A.* **69**: 81995b).
KADHIM, A. H. and OFFEN, H. W., " Spectroscopy of EDA complexes at high pressures. VI. Absorption and fluorescence of crystalline TNB and TNF complexes," *J. Chem. Phys.* **48**, N 2, 749–53 (1968) (Eng) (*P.A.* **68**: 27635).
KADHIM, A. H. and OFFEN, H. W., " Spectroscopy of EDA complexes at high pressures. V. Absorption of crystalline TCNE complexes." *Mol. Cryst.* **3**, N 3, 311–23 (1968) (Eng).
KAWABE, M., MASUDA, K. and YAMAGUCHI, J., " A conductivity of pyrene iodine charge-transfer complex," *J. Phys. Soc. Jap.* **24**, N 6, 1281–5 (1968) (Eng).
KOLNINOV, O. V., VOZZHENNIKOV, V. M., ZVONKOVA, Z. V., GLUSHKOVA, V. P. and SHAPIRO, E. E., " Photo EMF and electrical conductivity of complexes of aromatic hydrocarbons with tetracyanequinodimethane," *Dokl. Akad. Nauk SSSR* **189**, N 2, 353–6 (1969) (Russ).
KROLL, M., " Molecular complexes and their spectra; XX. Gas phase electron donor-acceptor complexes, *J. Amer. Chem. Soc.* **90**, N 5, 1097–105 (1968) (Eng).
KURIK, M. V., MOTUZ, A. A. and FROLOVA, E. K., " Synthesis and study of absorption spectra of a 9,10-dichloroanthracene complex with chloranil," *Ukr. Fiz. Zh.* **14**, N 4, 679–82 (1969) (Ukr).
KUZMIN, M. G. and GUSEVA, L. N., " Donor-acceptor complexes of singlet excited states of aromatic hydrocarbons with aliphatic amines," *Chem. Phys. Letters* **3**, N 2, 71–2 (1969) (Eng) (*P.A.* **69**: 23096).
LIPPERT, J. L., HANNA, M. W. and TROTTER, P. J., " Bonding in donor-acceptor complexes. III. The relative contributions of electrostatic, charge-transfer, and exchange interactions in aromatic-halogen and aromatic-TCNE complexes," *J. Amer. Chem. Soc.* **91**, N 15, 4035–44 (1969) (Eng).
LOWER, S. K., " Mixed-donor charge-transfer complexes: a new type of nonstoichiometric compound," *Mol. Cryst. and Liquid Cryst.* **5**, N 4, 363–8 (1969) (Eng).
LUNINA, E. V., MAMLEEVA, N. A., ANTIPINA, T. V. and GOLUBEV, V. B., " Interaction of anthraquinone and anthracene with the surface of a fluorinated aluminum oxide," *Zh. Fiz. Khim.* **43**, N 4, 976–9 (1969) (Russ).
LYONS, L. E., MOORE, J. E. and MORRIS, G. C., " Electron exchange between anthracene anions and pyrene molecules in solution," *Aust. J. Chem.* **21**, N 11, 2789–91 (1968) (Eng).
MAEKAWA, T., " Contribution of charge-transfer structure to exchange interaction in the crystal of organic free radical," *Bull. Chem. Soc. Jap.* **42**, N 8, 2362–3 (1969) (Eng).
MANTIONE, M. J., " Van der Waals interactions in molecular complexes of tetracyanoethylene," *Theor. Chim. Acta* **15**, N 2, 141–8 (1969) (Eng).
MANTIONE, M. J., " Polarization contribution to the dipole moment and infrared spectrum intensity of the benzene-iodine complex," *Int. J. Quantum Chem.* **3**, N 2, 185–94 (1969) (Eng).
MATAGA, N. and MURATA, Y., " Electron donor-acceptor interactions in the fluorescent state of tetracyano-benzene-aromatic hydrocarbon complexes," *J. Amer. Chem. Soc.* **91**, N 12, 3144–52 (1969) (Eng).
MOSZYNSKA, B., " Infrared spectra of donors in charge-transfer complexes. I. Methyl group stretching band in hexamethyl-benzene," *Bull. Acad. Pol. Sci., Ser. Sci., Math., Astron. Phys.* **17**, N 2, 99–102 (1969) (Eng).
MULLIKEN, R. S., " Electron-donor acceptor interactions and charge-transfer spectra," *Proc. Robert A. Welch Found. Conf. Chem. Res. 1967.* N 11, 109–50 (1968) (Eng) (*C.A.* **69**: 101224b).
NAKAJIMA, A., " On the emission of excited complexes formed between condensed aromatic hydrocarbons and aliphatic amines," *Bull. Chem. Soc. Jap.* **42**, N 12, 3409–14 (1969) (Eng).
OVCHINNIKOV, A. A. and OVCHINNIKOVA, M. Y., " Radiationless transition with charge-transfer in a polar medium," *Dokl. Akad. Nauk SSSR* **186**, N 1, 76–7 (1969) (Russ).
PANKRATOV, A. A. and PRUDNIKOV, I. M., " Photoactivation of aromatic molecules on a magnesium oxide surface," *Teor. Eksp. Khim.* **5**, N 1, 107–14 (1969) (Russ).
PROCHOROW, J. and SIEGOCZYNSKI, R., " Radiative and radiationless processes in charge-transfer complexes," *Chem. Phys. Letters* **3**, N 8, 635–9 (1969) (Eng).
ROBINSON, P. M. and SCOTT, H. G., " The anthracene-carbazole system," *Mol. Cryst. and Liquid Cryst.* **5** N 4, 387–404 (1969) (Eng).
SACKMANN, E. and KREBS, P., " ESR and optical studies of charge-transfer complexes oriented in liquid crystals," *Chem. Phys. Letters* **4**, N 2, 65–7 (1969) (Eng).
SCHULTE-FROHLINDE, D. and PFEFFERKORN, R., " Intermolecular fluorescence quenching of substituted naphthalene derivatives induced by charge-transfer processes," *Ber. Bunsenges. Phys. Chem.* **72**, N 2, 330–4 (1968) (Eng) (*P.A.* **69**: 20972).
SHORT, G. D., " Long-lived luminescence of charge-transfer complexes," *Chem. Communs*, N 23, 1500–1 (1968) (Eng) (*C.A.* **69**: 42621d).
SLOBODYANIK, V. V. and FAIDYSH, A. N., " Luminescence of anthracene-alkali metal complexes, and their effect on the photoconductivity of anthracene crystals," *Optics and Spectrosc.* **26**, N 2, 257–63 (1969) (Russ).
SZCZEPANIAK, K. and GOLINSKA, M., " Infrared spectra of hydrogen-bonded complexes of aromatic hydrocarbons bases," *Acta Phys. Polon.* **34**, N 3, 421–36 (1968) (Eng).
TRAMER, A., SOKOLOWSKA, A. and MOSZYNSKA, B., " Polarized infrared spectrum of p-xylene-carbon tetrabromide complex," *Acta Phys. Polon.* **35**, N 1, 39–47 (1969) (Eng).
VOZZHENNIKOV, V. M., ZVONKOVA, Z. V., SHLYAKHINA, L. P. and BEREZKIN, V. V., " Electrophysical properties of some charge transfer complexes." *Zh. Fiz. Khim.* **43**, N 9, 2297–300 (1969) (Russ).
YATSIMIRSKII, K. B., " Chemical bonding and Mendeleev's periodic law." *Teor. Eksp. Khim.* **5** N 5, 579–84. (1969) (Russ).

4.2. Excimers, Dimers and Other Homomolecular Complexes

BIRKS, J. B., " Higher excited states of benzene and toluene excimers," *Chem. Phys. Letters* **11**, N 13, 625–6 (1968) (Eng) (*C.A.* **69**: 23386u).

CHANDRA, A. K. and LIM, E. C., " Excimer luminescence," *Molec. Lumin., Int. Conf. 1968*, New York, W. A. Benjamin, 249–66 (1969) (Eng) (*C.A.* **69**: 26324z).

CHRISTIE, J. and SELINGER, B., " A Hückel M.O. treatment of excimers as intermediates for photodimers of methoxynaphthalene," *Photochem. Photobiol.* **9**, N 5, 471–3 (1968) (Eng).

GIBBERD, R. W., " A reformulation of the dimer problem," *Canad. J. Phys.* **46**, N 15, 168–4 (1968) (Eng).

HIRAYAMA, E. and LIPSKY, S., " Excimer fluorescence of alkyl substituted benzenes," *Molec. Lumin. Int. Conf. 1968*, New York, W. A. Benjamin. 237–47 (1969) (Eng) (*C.A.* **69**: 26325a).

BADGER, B. and BROCKLEHURST, B., " Absorption spectra of dimer cations. II. Benzene derivatives," *Trans. Faraday Soc.* **65**, N 562, pt. 10, 2582–7 (1969) (Eng).

BADGER, B. and BROCKLEHURST, B., " Absorption spectra of dimer cations; III. Naphthalene and anthracene derivatives and pyrene," *Trans. Faraday Soc.* **65**, N 562, pt. 10, 2588–94 (1969) (Eng).

BIRKS, J. B. and KAZZAZ, A. A., " Excimer fluorescence. XII. The pyrene crystal excimer interaction potential," *Proc. Roy. Soc., Ser. A* **304**, N 1478, 291–301 (1968) (Eng) (*P.A.* **69**: 1834).

BIRKS, J. B., " The pyrene excimer," *Acta Phys. Polon.* **34**, N 4, 603–17 (1968) (Eng) (*P.A.* **69**: 15897).

BRIEGLER, G., SCHUSTER, H. and HERRE, W., " Triplet excimers favoured by charge-transfer in electron-donor-acceptor-complexes," *Chem. Phys. Letters* **4**, N 2, 53–8 (1969) (Eng) (*P.A.* **70**: 9183).

CHAKRABARTI, S. K., " Excimer emission from tetrachloro-*p*-xylene," *Mol. Phys.* **16**, N 4, 417–19 (1969) (Eng).

CHAMBERS, R. W. and KEARNS, D. R., " Effect of dimer formation on the triplet states of organic dyes," *J. Phys. Chem.* **72**, N 12, 4718–20 (Eng).

CHANDRA, A. K. and LIM, E. C., " Semiempirical theory of excimer luminescence," *J. Chem. Phys.* **48**, N 6, 2589–95 (1968) (Eng) (*P.A.* **68**: 118296h).

CHANDRA, A. K. and LIM, E. C., " Semiempirical theory of excimer luminescence. Comparison with previous theories and consideration of the transition probability and the stability of the excimer triplet state," *J. Chem. Phys.* **49**, N 11, 5066–72 (1968) (Eng).

CHERKASOV, A. S. and OBYKNOVENNAYA, I. E., " Mixed excimers of anthracene derivatives," *Proc. Int. Conf. Lumin. 1966*, Budapest, **1**, 496–502 (1968) (Eng) (*P.A.* **70**: 11372).

GOLDSCHMIDT, C. R., TOMKIEWICZ, Y. and WEINREB, A., " Influence of excimer formation on the transfer of excitation energy from pyrene to perylene," *Spectrochim. Acta* **25**, N 8, 1471–7 (1969) (Eng).

GOLDSCHMIDT, C. R., TOMKIEWICZ, Y. and BERLMAN, I. B., " A saturation of excimer formation," *Chem. Phys. Letters* **2**, N 8, 536–8 (1968) (Eng).

GREENLEAF, J. R., LUMB, M. D. and BIRKS, J. B., " Molecular and excimer fluorescence of toluene," *J. Phys. B, Proc. Phys. Soc.* **1**, N 6, 1157–9 (1968) (Eng).

HIRAYAMA, F. and LIPSKY, S., " Excimer fluorescence of benzene and its alkyl derivatives-concentration and temperature dependence," *J. Chem. Phys.* **51**, N 5, 1939–51 (1969) (Eng) (*P.A.* **70**: 14628).

HORROCKS, D. L., " Effect of solvent on excimer fluorescence yields," *J. Chem. Phys.* **51**, N 12, 5443–8 (1969) (Eng).

ITOH, M., " Exciton splitting of absorption spectra in radical dimers," *Chem. Phys. Letters* **2**, N 6, 371–3 (1968) (Eng) (*C.A.* **69**: 24388d).

JONELEIT, D., " Excimer formation in organic liquids by electron excitation," *Z. Naturforsch.* **24A** N 11, 1809–20 (1969) (Ger).

KELLER, A., " Polymer crystals." *Reports on progress in physics* **33**, pt. 2, 623–704 (1968) (Eng).

KIM, J. J., BEARDSLEE, R. A., PHILLIPS, D. T. and OFFEN, H. W., " Fluorescence lifetimes of pyrene monomer and excimer at high pressures," *J. Chem. Phys.* **51**, N 6, 2761–2 (1969) (Eng) (*P.A.* **70**: 18730).

KING, C. M. and NIXON, E. R., " Matrix-isolation study on the hydrogen cyanide dimer," *J. Chem. Phys.* **48**, N 4, 1685–95 (1968) (Eng).

KLIMOVA, L. A., NERSESOVA, G. N. and GLYADKOVSKY, V. I., " Anthracene aggregates in solutions," *Optics and Spectrosc.* **25**, N 2, 290–2 (1968) (Russ).

MATAGA, N., OKADA, T. and EZUMI, K., " Luminescence of heteropolar excimers," *Proceedings of the International Conference on luminescence*, Budapest, 1966, **1** and **2**, Budapest, Akademiai Kiado, 431–5 (1968) (Eng) (*P.A.* **70**: 10916).

OBYNKNOVENNAYA, I. E. and CHERKASOV, A. S., " Composite dimezosubstituted anthracenes-1,2-benz anthracene excimers," *Optics and Spectrosc.* **24**, N 1, 46–51 (1968) (Russ).

PHILLIPS, D. H. and SCHUG, J. C., " Luminescence from aromatic polymers, monomers, and dimers under high-energy electron excitation," *J. Chem. Phys.* **50**, N 8, 3297–306 (1969) (Eng) (*P.A.* **69**: 43259).

SINGH, S. and SANDORFY, C., " The electronic spectrum of the photodimer on benzo(a) anthracene," *Chem. Phys. Letters* **2**, N 7, 507–8 (1968) (Eng) (*P.A.* **69**: 13381).

SINGH, Y. and DAS GUPTA, A., " Formation of dimer in quadrupolar gases," *Proc. Phys. Soc. B*, **1** Ser. 2, N 5, 914–21 (1968) (Eng).

SPEED, R. and SELINGER, B. K., " Time-resolved electronic spectroscopy. I. Bimolecular rates for excimer formation," *Aust. J. Chem.* **22**, N 1, 9–17 (1969) (Eng) (*C.A.* **69**: 72604t).

SPINIVASAN, B. N., KINOSHITA, M. and MCGLYNN, S. P., " Delayed luminescence of organic mixed crystals. VI. Delayed excimer fluorescence of pyrene in biphenyl," *J. Chem. Phys.* **47**, N 12, 5090–6 (1968) (Eng).

SRINIVASAN, B. N., RUSSELL, J. V. and MCGLYNN, S. P., " Semiempirical molecular-orbital calculations. VI. Dimers of benzene," *J. Chem. Phys.* **48**, N 5, 1931–7 (1968) (Eng) (*P.A.* **68**: 34313).

STEVENS, B., " Solute-re-encounter probabilities from delayed excimer fluorescence," *Chem. Phys. Letters* **3**, N 4, 233–6 (1969) (Eng).

SUCRE, M. G., " Dimers composes de molecules dont l'excitation electronique entraine un deplacement de la configuration nucleaire d'equilibre accompagne d'un changement de constante de force," *Int. J. Quantum Chem.* **3**, N 4, 377–96 (1969) (Fr).

SUCRE, M. G., GENY, F. and LEFEBVRE, R., " Intensity patterns in absorption and fluorescence spectra of molecular dimers: a comparison between the vibronic and the Born-Oppenheimer approach," *J. Chem. Phys.* **49**, N 1, 458–64 (1968) (Eng).

WIERSMA, D. A., LICHTENBELT, J. H. and KOMMANDEUR, J., " Diphenylamine radical dimer as a color center in a molecular crystal," *J. Chem. Phys.* **50**, N 7, 2794–805 (1969) (Eng).

WILAIRAT, P. and SELINGER, B., "The photoassociation of some substituted naphthalene. II. The photodimers of naphthol ethers," *Aust. J. Chem.* **21**, N 3, 733–46 (1968) (Eng).
YOUNG, J. H., "Vibronic coupling in the dimer," *J. Chem. Phys.* **49**, N 6, 2566–73 (1968) (Eng).

5. Spectra of Pure Molecular Crystals

5.1. Electronic Singlet States and Absorption Spectra

ALBERTI, F., ASHBY, R. A. and DOUGLAS, A. E., "Absorption spectra of oxygen in the $a^1\Delta_g$, $b^1\Sigma_g$, and $X^3\Sigma_g$ states," *Canad. J. Phys.* **46**, N 5, 337–42 (1968) (Eng) (*C.A.* **68**: 100269s).
AMANO, T., KURODA, H. and AKAMATU, H., "The charge-transfer bands in the crystal spectra of molecular compounds of tetramethylbezidine and those of benzidine," *Bull. Chem. Soc. Jap.* **42**, N 3 671–6 (1969) (Eng).
BENARROCHE, M. and HENIN, C., "Effect of temperature on the first electronic transition of pure 2,6-dimethylnaphthalene," *J. Chim. Phys.* (*France*) **65**, N 9, 1599–605 (1968) (Eng) (*P.A.* **69**: 15178).
BLECH, I. A. and MEIERAN, E. S., "Some anomalous absorption effects on the shape of single-crystal rocking curves," *Phys. Rev.* **179**, N 3, 731–5 (1969) (Eng).
BREE, A., FAN, C. Y. and KYDD, R. A., "The polarized absorption spectra of acenaphthylene," *Spectrochim. Acta* **25A**, N 8, 1375–80 (1969) (Eng).
BREE, A. and ZWARICH, R., "Study of some excited singlet and triplet electronic states of fluorene," *J. Chem. Phys.* **51**, N 3, 903–12 (1969) (Eng) (*P.A.* **70**: 6992).
BROUDE, V. L., *Analysis of spectrum of the benzene and deutero mixed crystals*, Preprint of the Institute of Solid State Physics. Moscow, (1969) (Russ).
BROUDE, V. L., "Electron terms of crystals of deutero benzenes and their mixtures," *Fiz. Tverd. Tela* **11**, N 5, 1159–67 (1969) (Russ).
CHAUDHURI, M. K. and GANGULY, S. C., "Absorption and fluorescence spectra of crystalline trans-stilbene," *Proc. Phys. Soc. C* **2**, Ser. 2, N 9, 1560–5 (1969) (Eng) (*P.A.* **70**: 2339).
CHAUDHURI, N. K. and EL-SAYED, M. A., "Molecular origin of the optical rotatory dispersion of the benzil crystal," *J. Chem. Phys.* **47**, N 3, 1133–43 (1968) (Eng) (*P.A.* **68**: 2463).
CLARK, L. B., "Dependence of the electronic spectra of anthracene crystals on propagation direction," *J. Chem. Phys.* **51**, N 12, 5719–20 (1969) (Eng) (*P.A.* **70**: 26056).
FROLOVA, E. K. and KURIK, M. V., "Urbach rule in 9,10-dichloranthracene," *Phys. Status Solidi* **33**, N 2, K99–K102 (1969) (Eng) (*P.A.* **69**: 39849).
FULTON, A., "The absorption spectra of the anions of quinones and other acceptors in solution and as solids," *Aust. J. Chem.* **21**, N 12, 2847–52 (1968) (Eng).
GEACINTOV, N., POPE, M. and KALLMANN, H., "Ionic states in tetracene crystals," *Proceedings of the International Conference on Luminescence, Budapest, 1966*, **1** and **2**, Budapest, Akademiai Kiado, 260–4 (1968) (Eng) (*P.A.* **70**: 12595).
HAENSEL, R., KEITEL, G., SCHREIBER, P. and KUNZ, C., "Optical absorption of solid krypton and xenon in the far ultraviolet," *Phys. Rev.* **188**, N 3, 1375–80 (1969) (Eng) (P.A. **70**: 26046).
HUTH, B. G. and FARMER, G. I., "Laser action in 9,10-diphenylanthracene," *IEEE J. Quantum Electron* **4**, N 6, 427 (1968) (Eng).
IIDA, Y., "Electronic spectra of crystalline TCNQ anion radical salts. II. Complex salts," *Bull. Chem. Soc. Jap.* **42**, N 3, 637–43 (1969) (Eng).
KATAYAMA MIKIO, "Organic crystals and lasers," *Kagaku No Ryoiki* **23**, N 1, 49–55 (1969) (Japan) (*C.A.* **69**: 26104c).
KLIMUSHEVA, G. V., LERMAN, B. M., TYUNKINA, N. I. and YAREMKO, R. V., "Electronic-vibrational spectra of crystals of some p-dialkylbenzenes," *Optics and Spectrosc.* **25**, N 2, 243–8 (1968) (Russ) (*C.A.* **68**: 81937k).
KLIMUSHEVA, G. V. and YATSENKO, L. P., "Electronic absorption spectra of crystals of polyalkyl-substituted benzene at 20-deg.-K," *Ukr. Fiz. Zh.* **13**, N 5, 829–38 (1968) (Ukr) (*P.A.* **68**: 41162).
KURIK, M. V. and TSIKORA, L. I., "Temperature dependence of the shape of the b-band of pentacene absorption," *Fiz. Tverd. Tela* **11**, N 9, 2624–6 (1969) (Russ).
KURODA, H., "Polarized absorption spectra of single crystals of ferrocene and its molecular complexes," *J. Mol. Spectrosc.* **30**, N 3, 355–64 (1969) (Eng).
LE BRUMANT, J., BARBE, A. and JOUVE, P. "Infrared absorption spectrum of solid ozone at 10°K," *C. R. Acad. Sci., Paris* **268B**, N 7, 549–51 (1969) (Fr) (*P.A.* **69**: 45329).
LITVINENKO, U. G., EREMENKO, V. V. and GARBER, T. I., "Features of light absorption by crystalline alpha oxygen in the 7000–11500 cm^{-1} range," *Ukr. Fiz. Zh.* **14**, N 2, 327–9 (1969) (Ukr).
MAEKAWA, T., "Contribution of charge transfer structure to exchange interaction in the crystal of organic free radical," *Bull. Chem. Soc. Jap.* **42**, N 8, 2362–3 (1969) (Eng).
OFFEN, H. W. and BEARDSLEE, R. A., "Perylene crystal spectra under pressure," *J. Chem. Phys.* **48**, N 8, 3584–7 (1968) (Eng) (*P.A.* **68**: 41168).
PESTEIL, P., PESTEIL, L. and DANOY, J.-P., "Excitonic structure of the absorption and phosphorescence spectra of the (3)B (2U) (N-PI(*)-(1)A(LG) transition in pyrazine at 4-deg.-K," *C.R. Acad. Sci., Paris* **268A**, and **B** N 26, 1774–7 (1969) (Fr).
PRIKHOT'KO, A. F. and PARHOMOVA, O. S., "Absorption of solid oxygen at 4-deg.-K, in the range 15000–33000 cm^{-1}," *Ukr. Fiz. Zh.* **13**, N 1, 19–27 (1968) (Ukr).
PRIKHOT'KO, A. F., SKOROBOGAT'KO, A. F. and TSIKORA, L. I., "Spectral studies of pentacene crystals," *Optics and Spectrosc.* **26**, N 6, 966–71 (1969) (Russ).
PRIKHOT'KO, A. F. and SKOROBOGAT'KO, A. F., "Spectral studies of 4,6,8-trimethylazulene crystal," *Optics and Spectrosc.* **26**, N 3, 375–8 (1969) (Russ).
RAZ, B. and JORTNER, J., "Energy of the quasi-free electron state in liquid and solid rare gases," *Chem. Phys. Letters* **4**, N 3, 155–8 (1969) (Eng).
SACKMANN, E., "Electric field induced orientation of liquid crystals and optical absorption experiments," *Chem. Phys. Letters*, **3**, N 4, 253–4 (1969) (Eng).
SACKMANN, E. and KREBS, P., "ESR and optical studies of charge-transfer complexes oriented in liquid crystals," *Chem. Phys. Letters* **4**, N 2, 65–7 (1969) (Eng).
SAUTER, H. and ALBRECHT, A. C., "Electric-field broadening of an electronic transition in azulene." *Chem. Phys. Letters* **2**, N 1, 8-10 (1968) (Eng) (*P.A.* **68**: 45238).

SCOTT, J. D. and WATSON, W. H., " Polarization of the absorption and emission spectra of 9,10-anthraquinone and 2-methyl-9,10-anthraquinone," *J. Chem. Phys.* **49**, N 9, 4246–7 (1968) (Eng).
SHEKA, E. F., " Electronic-vibrational spectra of molecules and crystals," Preprint of the Institute of Solid State Physics, Moscow, (1969).
SRINIVASACHARYA, K. G., " The near ultraviolet absorption spectra of certain halogen substituted benzenes in the solid state," *Indian J. Pure and Appl. Phys.* **7**, N 1, 62–3 (1969) (Eng).
TANAKA, J. and SHIBATA, M., " Electronic absorption and emission spectra of 9,10-dichloroanthracene and 9,10-dibromoanthracene crystals," *Bull. Chem. Soc. Jap.* **41**, N 1, 34–41 (1968) (Eng) (*C.A.* **68**: 91509j).
THOMAS, J. M. and WILLIAMS, J. O., " Some electronic and chemical consequences of non-basal dislocations in crystalline anthracene," *Mol. Cryst. and Liquid Cryst.* **9**, 59–79 (1969) (Eng).
VALA, M., JR. and TANAKA, J., " Aromatic carbonyl spectra. I. The polarized absorption spectrum of single-crystal 4,4'-dichlorobenzophenone," *J. Chem. Phys.* **49**, N 12, 5322–34 (1968) (Eng).
WEBMAN, I. and JORTNER, J., " Energy dependence of two-photon-absorption cross sections in anthracene," *J. Chem. Phys.* **50**, N 6, 2706–16 (1969) (Eng).
ZHIGUNOVA, I. A., KLIMUSHEVA, G. V. and YATSENKO, L. P., " Vibrational structure of electronic spectra of para-disubstituted benzenes," *Ukr. Fiz. Zh.* **14**, N 1, 66–71 (1969) (Ukr).

5.2. Electronic Triplet States and Absorption Spectra. ESR Spectra

AZUMI, T. and NAGAKURA, S., " Zeeman effect of phosphorescence. III. Theory of photoselection for Zeeman split phosphorescence," *Tech. Rept. ISSP* **A**, N 309, 20 pp. (1968) (Eng).
BURLAND, D. M. and CASTRO, G., " Experimental observation of factor-group splitting in the benzene $^1B_{1u}$ state," *J. Chem. Phys.* **50**, N 9, 4107–8 (1969) (Eng) (*P.A.* **69**: 35692).
CLARKE, R. H. and HOCHSTRASSER, R. M., " Polarization of transitions to the magnetic substates of triplet excitons," *J. Chem. Phys.* **48**, N 4, 1745–8 (1968) (Eng) (*P.A.* **68**: 31296).
DUROCHER, G. and WILLIAMS, D. F., " Polarized singlet-triplet absorption spectra of normal and deuterated anthracene crystals," *J. Chem. Phys.* **51**, N 12, 5405–14 (1969) (Eng.) (*P.A.* **70**: 26055).
GONDO, Y. and MAKI, A. H., " Triplet-state zero-field splittings in some aromatic hydrocarbons and nitrogen heterocycles," *J. Chem. Phys.*, **50**, N 8, 3270–9 (1969) (Eng) (P.A. 69: 42425).
DE GROOT, M. S., HESSELMANN, I. A. M. and VAN DER WAALS, J. H., " Paramagnetic resonance in phosphorescent aromatic hydrocarbons. V. The benzene in perdeuterobenzene crystal," *Mol. Phys.* **16**, N 1, 45–60 (1969) (Eng).
DE GROOT, M. S., HESSELMAN, I. A. M. and VAN DER WAALS, J. H., " Paramagnetic resonance in phosphorescent aromatic hydrocarbons. VI. Mesitylene in B-trimethylborazone," *Mol. Phys.* **16**, N 1, 61–8 (1969) (Eng).
HAARER, D. and WOLF, H. C., " Spin relaxation and optical spin polarisation of triplet excitons in naphthalene," *Phys. Status, Solidi* **33**, N 2, K117–K120 (1969) (Eng) (P.A. 69: 39915).
KINOSHITA, M., " Electron spin resonance study of phosphorescence," *Bussei* **9**, N 5, 223–42 (1968) (Japan) (C.A. 69: 72256k).
MEYER, Y. H. and ASTIER, R., " Dichroism of the anthracene triplet," *J. Phys.* (*Paris*) **29**, N 11–12, 1075–80 (1968) (Fr) (C.A. 69: 91996p).
MORAN, P. R., " Band structure limits for anthracene triplet excitons from magnetic resonance," *Phys. Letters* **28A**, N 11, 781–2 (1969) (Eng) (P.A. 69: 35667).
SCHWOERER, M. and SIXL, H., " Optische Spin-Polarisation im Triplett-Zustand von Naphthalin," *Z. Naturforsch*, **24A**, N 6, 952–67 (1969) (Ger).
SHARNOFF, M., " ESR of the triplet state of benzophenone," *J. Chem. Phys.* **51**, N 1, 451–2 (1969) (Eng).
UDAGAWA, Y., AZUMI, T., ITO, M. and NAGAKURA, S., " Phosphorescence and triplet–singlet absorption spectra of benzophenone crystal at 4.2 °K," *J. Chem. Phys.* **49**, N 9, 3764–71 (1968) (Eng) (P.A. 69: 10251).
WEISZ, S. Z., RICHARDSON, P., COBAS, A. and JARNAGIN, R. C., " Triplet sampled radiation damage," *Mol. Cryst.* **4**, N 1–4, 277–92 (1968) (Eng) (P.A. 69: 12472).
WHITTEN, W. B. and ARNDT, R. A., " Triplet exciton decay in phenanthrene single crystals," *Mol. Cryst. and Liq. Cryst.* **9**, 239–48 (1969) (Eng).

5.3. Vibrational and Phonon Spectra

AMINOV, N. M. and KOCHELAEV, B. I., " Quasi local vibrations induced by electron transfers," *Fiz. Tverd. Tela* **11**, N 10, 2906–9 (1969) (Russ).
ANDERSON, A. B., HANDY, N. C. and PARR, R. G., " Relationships between vibrational force constants and quadrupole coupling constants for molecules and solids," *J. Chem. Phys.* **50**, N 8, 3634–5 (1969) (Eng).
BREE, A. and KYDD, R. A., " Infrared spectrum of anthracene-d_{10}," *J. Chem. Phys.* **51**, N 3, 989–95 (1969) (Eng) (P.A. 70: 8973).
BREE, A. and KYDD, R. A., " The Raman spectrum of anthracene-d_{10}," *Chem. Phys. Letters* **3**, N 6, 357–60 (1969) (Eng) (P.A. 70: 2347).
BREE, A., KYDD, R. A. and MISRA, T. N., " A vibrational assignment of acenaphthene," *Spectrochim. Acta* **25A**, N 11, 1815–29 (1969) (Eng).
BREE, A. and ZWARICH, R., " Vibrational assignment of fluorene from the infrared and Raman spectra," *J. Chem. Phys.* **51**, N 3, 912–20 (1969) (Eng) (P.A. 70: 6993).
CLAUS, R., HACKER, H. H., SCHRÖTTER, H. W. and BRANDMÜLLER, J., " Low-frequency optical-phonon spectrum of benzil," *Phys. Rev.* **187**, N 3, 1128–51 (1969) (Eng).
DIZABO, P., GATICA, H.-E. and LECALVE, N., " Preparation and vibration spectra of 1,5-, 1,8-, and 2-6-dideuterionaphthalene," *J. Chim. Phys.* (*France*) **66**, N 9, 1497–501 (1969) (Fr).
EVANS, J. C., " Recent advances in Raman spectroscopy," *Advances in analytical chemistry and instrumentation* **7**, New York-London-Sydney-Toronto, 41–66 (1968) (Eng).
FEDOROV, V. P., KORSHUNOV, A. V. and VOLKOV, V. E., " Identification of some weak bands in i.r. absorption spectra of crystalline 1,2,3- and 1,3,5-trihalogen substituted benzene," *Zh. Prikl. Spectrosc.* **11**, N 5, 906–8 (1969) (Russ) (P.A. 70: 37707).
FIALKOVSKAYA, O. V. and NEFEDOV, A. V., " Polarization of the vibrational spectra of molecules of various systems," *Optics and Spectrosc.* **26**, N 5, 847–50 (1969) (Eng).
FIALKOVSKAYA, O. V. and NEFEDOV, A. V., " Vibrational processes in molecules of different symmetry but almost similar in mass and structure," *Optics and Spectrosc.* **25**, N 5, 766–8 (1968) (Russ).

GORELIK, V. S., SUSHCHINSKII, M. M. and NOVIK, A. E., " Raman effect cross section of stilbene and sodium nitrate crystals," *Fiz. Tverd. Tela* **11**, N 3, 771–3 (1969) (Russ).

HADNI, A., " The far infrared absorption of molecular crystals " *Excitons, magnons and phonons in molecular crystals, Beirut, Lebanon, 15–18 Jan 1968*, London, England: Cambridge, 31–42 (1968) (Eng) (P.A. 70: 12394).

HADNI, A., DEOAMPS, E. and HERBEUVAL, J.-P., " Far-infrared absorption spectra of molecular crystals of tetrahedral or pyramidal molecules," *J. Chim. Phys. (France)* **65**, N 5, 959–61 (1968) (Fr) (P.A. 68: 45223).

IPATOVA, I. P., MARADUDIN, A. A. and SUBASHIEV, A. V., " Temperature dependence of the integral intensity of light absorption by quasilocal vibrations," *Fiz. Tverd. Tela* **11**, N 8, 2271–81 (1969) (Russ).

ITO, M., SUZUKI, M. and YOKOYAMA, T., " Raman active lattice vibrations of organic crystals," *Excitons magnons and phonons in molecular crystals, Beirut, Lebanon, 15–18 Jan 1968*, London, England: Cambridge, 1–30 (1968) (Eng) (P.A. 70: 12440).

KAJIURA, T., " Laser-excited Raman spectra of microsamples," *Bunseki Kagaku* **17**, N 5, 632–4 (1968) (Japan) (C.A. 69: 56057r).

KORSHUNOV, A. V. and MAMIZEROVA, L. I., " Relative intensities of the lines of intermolecular and lattice vibrations in Raman spectra of crystals of some aromatic compounds," *Optics and Spectrosc.* **26**, N 6, 1034–5 (1969) (Russ).

KORSHUNOV, A. V., SHABANOV, V. F. and VOLKOV, V. E., " Temperature studies of low frequency Raman spectra of crystalline molecular complexes," *Zh. Strukt. Khim*, **10**, N 6, 1122–4 (1969) (Russ).

KRUSHINSKII, L. L. and SAFARYAN, F. P., " Theory of infrared spectra connected with nuclear vibrations in crystals and polyatomic molecules," *Dokl. Akad. Nauk Arm. SSR* **48**, N 1, 36–42 (1969) (Russ).

KUWATA, H., " Infrared spectra of crystalline polyphenyl. I. Linear polyphenyl," *J. Sci Hiroshima Univ., Ser. A* **32**, N 1, 87–99 (1968) (Eng).

LUTY, T. and ROHLEDER, J. W., " Absorption spectra of 2,3-dimethylnaphthalene single crystals in the near infrared," *Acta Phys. Polon.* **34**, N 2, 257–66 (1968) (Eng) (P.A. 69: 5933).

LISITZA, M. P. and YAREMKO, M. A., " Fermi resonance in molecular crystals," *Optics and Spectrosc.* **25**, N 6, 864–8 (1968) (Russ).

MEINNEL, J., SANQUER, M. and MILWARD, R., " Lattice vibrations of single crystal 1-iodo-2,3,5,6-tetra methylbenzene," *C. R. Acad. Sci., Paris* **268 A** and **B**, N 10, 751–4 (1969) (Fr).

NINOMIYA, T., " Dislocation vibration and phonon scattering," *J. Phys. Soc. Jap.* **25**, N 3, 830–40 (1968) (Eng).

OVCHINNIKOV, A. A., " Localized longlived vibrational states in molecular crystals," *Zh. Eksp. Teor. Fiz.* **57**, N 1, 263–70 (1969) (Russ).

PASQUIER, B., SOURISSEAU, C. and JOSIEN, M., " Low temperature infrared spectroscopy of benzene and benzene-d_6. Crystals, isotopic solid solutions and dilute solutions," *C. R. Acad. Sci., Paris* **268 A** and **B**, N 21, 1366–9 (1969) (Fr) (P.A. 70: 2308).

SOLIN, S. A. and RAMDAS, A. K., " Raman spectrum of crystalline benzil," *Phys. Rev.* **174**, N 3, 1069–75 (1968) (Eng) (P.A. 69: 5939).

STENMAN, F., " Raman scattering from powdered 9,10-anthraquinone," *J. Chem. Phys.* **51**, N 8, 3413–14 (1969) (Eng).

SUZUKI, M. and ITO, M., " Polarized Raman spectra of p-dichlorobenzene and p-dibromobenzene single crystals," *Spectrochim. Acta* **25A**, N 5, 1017–21 (1969) (Eng) (P.A. 69: 30104).

TOMCZAK, Z., CHMIELEWSKA, J., PRZEDMOJSKI, J. and TRAMER, A., " Vibration spectra of polysubstituted benzene derivatives. II. Crystal structure and infrared spectra of 2,5-dichloro-1,4-xylene and 4,5-dichloro -1,2-xylene crystals," *Acta Phys. Polon.* **33**, N 6, 1025–36 (1968) (Eng) (P.A. 68: 39833).

WYNCKE, B. et HADNI, A., " Sur la polarisation infrarouge de la raie de translation parallèle à l'axe monoclinique du naphthalène à 66 cm^{-1}," *J. Phys. (France)* **30**, N 11–12, 943–8 (1969) (Fr).

ZHIDKOV, L. G., KORSHUNOV, A. V. and TRET'YAKOV, A. G., " Temperature dependence of Raman scattering linewidths for a molecular crystal," *Izv. Vyssh. Ucheb. Zaved., Fiz.*, N 1, 37–41 (1969) (Russ).

5.4. Fluorescence and Phosphorescence

AVDEENKO, A. A., DOBROVOLSKAYA, T. L. and NABOIKIN, U. V., " Charge carrier photogeneration and luminescence in pyrene," *Fiz. Tverd. Tela* **10**, N 5, 1579–81 (1968) (Russ).

AZUMI, T. and NAKANO, Y., " Defect phosphorescence of pyrazine crystal," *Techn. Rept. ISSP* **A**, N 336, 46 pp. (1968) (Eng).

AZUMI, T., ITO M. and NAGAKURA, S., " Zeeman effect of phosphorescence. II. Intensity considerations on pyrazine phosphorescence," *Bull. Chem. Soc. Jap.* **42**, N 3, 685–9 (1969) (Eng).

BENZ, K. W., " Purity testing of zone purified naphthalene by measurement of triplet lifetime," *Z. Naturforsch* **24A**, N 2, 298 (1969) (Ger).

BONSCH, G., KLEINERT, G. and FLAMMERSFELD, A., " Scintillation light yield of thin films of anthracene," *Z. Phys.* **222**, N 4, 363–71 (1969) (Eng) (*P.A.* **69**: 35689).

BURNHAM, D. C. and CHIAO, R. Y., " Coherent resonance fluorescence excited by short light pulses," *Phys. Rev.* **188**, N 2, 667–75 (1969) (Eng).

CHAUDHURI, M. K. and GANGULY, S. C., " Absorption and fluorescence spectra of crystalline transstilbene," *J. Phys. C, Proc. Phys. Soc.* **2**, N 9, 1560–5 (1969) (Eng).

DONAHUE, J. M. and TEEGARDEN, K., " Luminescence from perturbed exciton states," *J. Phys. Chem. Solids* **29**, N 12, 2141–51 (1968) (Eng).

EL-SAYED, M. A. and MOOMAW, W. R., " The effect of phonons on the pyrazine phosphorescence," *Excitons, magnons and phonons in molecular crystals*, Beirut, Lebanon, 15–18 Jan 1968, London, England: Cambridge, 103–24 (1968) (Eng) (*P.A.* **70**: 12604).

FEOFILOV, P. P., " Polarization of the luminescence of isotropic media in the case of two-photon excitation," *Optics and Spectrosc.* **26**, N 4, 554–63 (1969) (Russ) (*P. A.* **70**: 22643).

FLEET, B., KELIHER, P. N., KIRKBRIGHT, G. F. and PICKFORD, C. J., "Electrochemiluminescence of solution mixtures. I. Anthanthrene, 9,10-diphenylanthracene, rubicene, rubrene," *Spectrosc. Letters* **2**, N 5, 133–9 (1969) (Eng).

FURST, M., KALLMANN, H. and LEVIN, E., " Liquid scintillators at high temperatures," *Mol. Cryst.* **4**, N 1–4, 213–30 (1968) (Eng).

GEACINTOV, N., POPE, M. and VOGEL, F., " Effect of magnetic field on the fluorescence of tetracene crystals: exciton fission," *Phys. Rev. Letters* **22**, N 12, 593–6 (1969) (Eng) (*P.A.* **69**: 26779).
GLOCKNER, E. and WOLF, H. C., " The fluorescence spectrum of anthracene crystals," *Z. Naturforsch.* **24A**, N 6, 943–51 (1969) (Ger) (*P.A.* **69**: 45351).
GOODE, D. H. and LIPSETT, F. R., " Delayed fluorescence of anthracene at low temperatures. Failure of square dependence on exciting light," *J. Chem. Phys.* **51**, N 3, 1222–7 (1969) (Eng) (*P.A.* **70**: 9033).
GRIBKOV, V. I. and ZHEVANDROV, N. D., " Polarization of prolonged luminescence of molecular crystals," *Optics and Spectrosc.* **24**, N 2, 237–40 (1968) (Russ) (*P.A.* **69**: 1836).
HAMMER, A. und WOLF, H. C., " Die Quantenausbeute der Fluoreszenz von Naphthalin-Kristallen", *Phys. Status Solidi* **33**, N 1, K25–K28 (1969) (Ger).
HIROOKA, T., KOCHI, M., AIHARA, J.-i., INOKUCHI, H. and HARADA, Y., " Photoemission from polycyclic aromatic crystals in the vacuum ultraviolet region. III. Aromatic crystals and charge-transfer complexes," *Bull. Chem. Soc. Jap.* **42**, N 6, 1481–9 (1969) (Eng).
HJORTENBERG, P., POPOVIC, J. and BRANDT, B., "Luminescence of anthracene as a possible means of γ and electron ray dosimetry," *Proc. Inter. Conf. Luminescence*, Budapest, 1966, **1** and **2**. Budapest, Akademiai Kiado, 2108–11 (1968) (Eng) (*P.A.* **70**: 12571).
IMAKUBO, K., " Luminescence of dinucleotides at 77 °K," *J. Phys. Soc. Jap.* **24**, N 5, 1124–32 (1968) (Eng).
JASEJA, T. S., PARKASH, V. and DHEER, M. K., " Fluorescence spectra of anthracene and naphthalene excited by giant-pulse ruby laser," *J. Appl. Phys.* **40**, N 4, 1882–3 (1969) (Eng) (*P.A.* **70**: 8203e).
KHAN-MAGOMETOVA, S. D., " Decrease in the photoluminescence yield of molecular crystals during electron bombardment," *Optics and Spectroscop.* **27**, N 1, 61–71 (1969) (Russ) (*P.A.* **70**: 44952).
KURIK, M. V., PRIKHOT'KO, A. F. and FROLOVA, E. K., " Luminescence of 9,10-dichloroanthracene single crystals," *Izv. Akad. Nauk SSSR, Ser. Fiz.* **32**, N 8, 1386–9 (1968) (Russ).
LAUSTRIAT, G., " The luminescence decay of organic scintillators." *Mol. Cryst.* **4**, N 1–4, 127–45 (1968) (Eng).
LEACH, S., LOPEZ-CAMPILLO, A., LOPEZ-DELGADO, R. and TOMAS-MAGOS, M. C., " The luminescence of benzene in the pure crystalline state and in crystalline solution as a function of concentration and thermal treatment," *Proc. Int. Conf. Luminescence*, Budapest, 1966, **1**, Budapest Akademiai Kiado, 270–4 (1968) (Eng) (*P.A.* **70**: 12573).
LOGAN, L. M., MUNRO, I. H., WILLIAMS, D. F. and LIPSETT, F. R., " Low-temperature studies of fluorescence emission from anthracene crystals," in *Molec. Lumin., Int. Conf. 1968*, New York, W. A. Benjamin, 773–85 (1969) (Eng) (*C.A.* **69**: 26305u).
MOEBIUS, D., " Distance rule of energy transfer based on sensitized fluorescence measurements," *Z. Naturforsch*, **24A**, N 2, 251–3 (1969) (Ger) (*P.A.* **69**: 24452).
OBUKHOVSKII, V. V. and STRIZHEVSKII, V. L., " Parametric luminescence in crystals involving polarition excitation," *Zh. Eksp. and Teor. Fiz* **57**, N 2, 520–8 (1969) (Russ).
ORLOFF, M. K. and BRINEN, J. S., " Zero-field splitting in phosphorescent triplet states of aromatic hydrocarbons. IV. Phenylnaphthalenes," *Int. J. Quantum Chem.* **3**, N 2, 225–30 (1969) (Eng).
POPE, M., " Charge-transfer exciton state, ionic energy levels, and delayed fluorescence in anthracene," *Mol. Cryst.* **4**, N 1–4, 183–90 (1968) (Eng) (*P.A.* **69**: 18437).
RENTZEPIS, P. M., " Emission from lowest singlet and triplet states of azulene," *Chem. Phys. Lett.* **3** N 9, 717–20 (1969) (Eng) (*P.A.* **70**: 6970).
RUSIN, B. A., RUMYANTSEV, B. M., ALEXANDROV, I. V. and FRANKEVICH, E. L., " Anisotropy of magnetic field quenching photoconductivity and delayed fluorescence of anthracene," *Phys. Status Solidi* **34**, N 2, K103–5 (1969) (Eng) (*P.A.* **70**: 8661).
SHARNOFF, M., " Electron spin resonance of the triplet state of a photochemical oxidation product of crystalline durene," *Mol. Cryst. and Liq. Cryst.* **5**, N 3, 297–302 (1969) (Eng).
SCOTT, J. D. and WATSON, W. H., " Polarization of the absorption and emission spectra of 9,10-anthraquinone and 2-methyl-9, 10-anthraquinone," *J. Chem. Phys.* **49**, N 9, 4246–7 (1968) (Eng).
SKARSTAD, P., MA, R. and LIPSKY, S., " The scintillation efficiency of benzene," *Mol. Cryst* **4**, N 1–4, 3–14 (1968) (Eng).
TANAKA, J. and SHIBATA, M., " Electronic absorption and emission spectra of 9,10-dichloroanthracene and 9,10-dibromoanthracene crystals," *Bull. Chem. Soc. Jap.* **41**, N 1, 34–41 (1968) (Eng).
TINTI, D. S., MOOMAW, W. R. and EL-SAYED, M. A., " Fine structure of the pyrazine crystal phosphorescence at 4.2 °K," *J. Chem. Phys.* **50**, N 2, 1035–6 (1969) (Eng).
UDAGAWA, Y., AZUMI, T., ITO, M. and NAGAKURA, S., " Phosphorescence and triplet←singlet absorption spectra of benzophenone crystal at 4.2 °K," *J. Chem. Phys.* **49**, N 9, 3764–71 (1968) (Eng) (*P.A.* **69**: 10251).
VAUBEL, G., " Recombination radiation in tetracene single crystals," *Phys. Status Solidi* **35**, N 1, K67–9 (1969) (Eng) (*P.A.* **70**: 9034).
VAUBEL, G., THOMA, P., RIEHL, N. and LENZ, P., " Stimulation of anthracene by infrared light at varied temperatures and the observation of phosphorescence." In *Proc. Int. Conf. Luminescence*, Budapest, 1966, **1** and **2**. Budapest, Akademiai Kiadi, 387–90 (1968) (Eng) (*P.A.* **70**: 12599).
WEINREB, A. and LEIBOWITZ, M., " On the vacuum ultraviolet excited luminescence of pure and doped polystyrene," *Mol. Cryst.* **4**, N 1–4, 15–31 (1968) (Eng).
ZHEVANDROV, N. D., " Investigation of the luminescence of molecular crystals," *Zh. Prikl. Spektrosk*, **8**, N 3, 383–8 (1968) (Russ) (*P.A.* **68**: 36452).

5.5. Dissipation of Excitation Energy

CALOIN, M. and CANDAU, S., " Thermal relaxation in benzene " *C. R. Acad. Sci., Paris* **269B**, N 10, 423–6 (1969) (Fr) (*P.A.* **70**: 3661).
DRENT, E., VAN DER DEIJL, G. M. and ZANDSTRA, P. J., " Direct measurement of S-T crossing relaxation time in azulenes," *Chem. Phys. Letters* **2**, N 8. 526–8 (1968) (Eng).
EL-SAYED, M. A. and MOOMAW, W. R., " The effect of phonons on the pyrazine phosphorescence." In *Excitons, magnons and phonons in molecular crystals*, Beirut, Lebanon, 15–18 Jan 1968, London, England, Cambridge, 103–24 (1968) (Eng) (*P.A.* **70**: 12604).
JONES, P. F. and SIEGEL, S., " Intersystem crossing in pyrene-h_{10} and pyrene-d_{10}," *Chem. Phys. Letters* **2**, N 7, 486–8 (1968) (Eng) (*C.A.* **69**: 42596z).
JORTNER, J. and BIXON, M., " Comments on electronic relaxation processes in molecular crystals," *Mol. Cryst. and Liquid Cryst.* **9**, 213–37 (1969) (Eng).

LAUSTRIAT, G., " The luminescence decay of organic scintillators," *Mol. Cryst.* **4**, N 1-4, 127-45 (1968) (Eng).
SLICHTER, W. P., " Nuclear magnetic relaxation in organic crystals," *Mol. Cryst. and Liq. Cryst.* **9** 81-99 (1969) (Eng).
WHITTEN, W. B. and ARNDT, R. A., " Triplet exciton decay in phenanthrene single crystals," *Mol. Cryst. and Liq. Cryst.* **9**, 239-48 (1969) (Eng).
YATES, E. A., CRANDALL, D. G. and KIRKBRIDE, J., " Quenching measurements on organic scintillators," *Mol. Cryst.* **4**, N 1-4, 165-70 (1968) (Eng).

6. Spectra of Impurity Molecular Crystals

6.1. Electronic, Vibronic and Vibrational Absorption Spectra

BERA, S. CH., MUKHERJEE, R. K. and CHOWDHURY, M., " Change of molecular geometry of benzil molecule in stilbene single crystal," *Ind. J. Pure and Appl. Phys.* **7**, N 5, 345-6 (1969) (Eng).
BERNSTEIN, E. R., COLSON, S. D., TINTI, D. S. and ROBINSON, G. W., " Static crystal effects on the vibronic structure of the phosphorescence, fluorescence, and absorption spectra of benzene isotopic mixed crystals," *J. Chem. Phys.* **48**, N 10, 4632-59 (1968) (Eng).
BERNSTEIN, E. R., " Site effects in isotopic mixed crystals-site shift, site splitting, orientational effect, and intermolecular Fermi resonance in the vibrational spectrum of benzene," *J. Chem. Phys.* **50**, N 11, 4842-56 (1969) (Eng) (*P.A.* **69**: 43007).
DAVYDOV, A. S., LUBCHENKO, A. F., " Urbach's rule for localized excitations in crystals," *Dokl. Akad. Nauk SSSR* **179**, N 6, 1301-3 (1968) (Russ) (*P.A.* **69**: 5905).
DOLGANOV, V. K., SHEKA, E. F., " Anomalies of vibronic absorption in impurity deuterio benzene crystals," *Fiz. Tverd. Tela.* **II**, N 9, 2427-34 (1969) (Russ).
DUNN, D., " Urbach's rule in impurity absorption," *Canad. J. Phys.* **47**, N 16, 1703-8 (1969) (Eng) (*P.A.* **69**: 45310).
FISCHER, G., " The 3000 Å absorption spectrum of phenanthrene in mixed crystals," *Mol. Cryst. and Liq. Cryst.* **6**, N 1, 105-23 (1969) (Eng).
GAEVSKII, A. S., LOGVINENKO, P. N. and FAIDYSH, A. N., " Triplet-triplet absorption by deutero-naphthalene impurities in benzophenone crystals," *Izv. Vyssh. Ucheb. Zaved., Fiz*, N 3, 157-9 (1969) (Russ) (*P.A.* **70**: 12601).
HANSON, D. M., KOPELMAN, R. and ROBINSON, G. W., " Information on the exciton band structure of the B_{2u} state of crystalline naphthalene from the variation of energy denominators method," *J. Chem. Phys.* **51**, N 1, 212-23 (1969) (Eng) (*P.A.* **70**: 1895).
HANSON, D. M., " Optical transitions in $^{13}CC_5H_6$—C_6H_6 mixed crystals in the region of the factor-group components of crystalline benzene," *J. Chem. Phys.* **51**, N 2, 653-4 (1969) (Eng).
HASEGAWA, H. and NAKAMURA, M., " Impurity bands in a magnetic field," *J. Phys. Soc. Jap.* **26**, N 6, 1362-77 (1969) (Eng).
HASS, M., ROSENSTOCK, H. B. and MCGILL, R. E., " Lattice vibrations and infrared absorption of mixed linear chains," *Solid State Commun.* **7**, N 1, 1-5 (1969) (Eng).
HONMA, A., " Method of moments for optical absorption bands of impurities in solids," *J. Phys. Soc. Jap.* **24**, N 5, 1082-95 (1968) (Eng) (*P.A.* **68**: 41028).
KORSACK, K. V. and KRIVOGLAZ, M. A., " Fine structure of the vibronic spectrum of impurity absorption or emission of light due to electron interaction with localized vibrations," *Fiz. Tverd. Tela.* **10**, N 8, 2488-99 (1968) (Russ) (*P.A.* **69**: 1762).
KORSAK, K. V., " Local oscillations and broadening of phonon-free lines in optical spectra of impurities in crystals," *Ukr. Fiz. Zh.* **13**, N 11, 1895-9 (1968) (Ukr.) (*P.A.* **69**: 7961).
KORSAK, K. V. and KRIVOGLAZ, M. A., " On some mechanisms of broadening electron-vibrational bands in spectra of impurity centres with local oscillations," *Ukr. Fiz. Zh.* **14**, N 3, 373-9 (1969) (Ukr.) (*P.A.* **69**: 26730).
KRIEGLER, R. J. and WELSH, H. L., " The induced infrared fundamental band of hydrogen dissolved in solid argon," *Canad. J. Phys.* **46**, N 10, Pt. I, 1181-9 (1968) (Eng).
KRISTOFEL, N. N., ZAVT, G. S., " Optical electron transitions between local and zone states in impurity centers," *Optics and Spectrosc.* **25**, N 5, 705-12 (1968) (Russ).
OSTAPENKO, N. I. and SHPAK, M. T., " Local exciton states in a benzene crystal with thiophene, furan and pyrrole impurities," *Izv. Akad. Nauk. SSSR, Ser. Fiz.* **32**, N 8, 1390-3 (1968) (Russ).
OSTAPENKO, N. I. and SHPAK, M. T., " Localized exciton states of doped naphthalene crystals," *Phys. Status Solidi* **36**, N 2, 515-24 (1969) (Eng) (*P.A.* **70**: 18097).
OSTAPENKO, N. I. and SHPAK, M. T., " Polarization investigations of localized exciton states of doped benzene crystals," *Phys. Status Solidi* **31**, N 2, 531-4 (1969) (Eng).
PASQUIER, B., SOURISSEAN, C. and JOSIEN, M., " Low-temperature infrared spectroscopy of benzene and benzene-d_6. Crystals, isotopic solid solutions, and dilute solutions," *C. R. Acad. Sci., Paris* **268 A** and **B**, N 21, 1366-9 (1969) (Fr) (*P.A.* **70**: 2308).
PATTSER, K., " Summation of excitation energy in impurity crystals," *Optics and Spectrosc.* **27**, N 6, 954-9 (1969) (Russ).
PRICHOT'KO, A. F. and SCOROBOGAT'KO, A. F., " About molecular spectrum of azulene," *Ukr. Fiz. Zh.* **13**, N 2, 343-6 (1968) (Ukr.).
PRIKHOT'KO, A. F., SKOROBOGAT'KO, A. F. and TSIKORA, L. I., " Spectra of pentacene in some crystalline solvents," *Optics and Spectrosc.* **26**, N 2, 214-19 (1969) (Russ).
WIERSMA, D. A., LICHTENBELT, J. H. and KOMMANDEUR, J., " Diphenylamine radical dimer as a color center in a molecular crystal," *J. Chem. Phys.* **50**, N 7, 2794-805 (1969) (Eng).
WILSON, R. S., KING, W. T. and KIM, S. K., " Theory of impurity-induced infred absorption," *Phys. Rev.* **175**, N 3, 1164-70 (1969) (Eng).

6.2. Fluorescence, Phosphorescence and Dissipation of Energy

ADAM, K. R. and O'DWYER, M. F., " Luminescence and triplet energy transfer in mixed crystals. I. Two-component systems," *Aust J. Chem.* **22**, N 10, 2060-84 (1969) (Eng).
ADAM, K. R. and O'DWYER, M. F., " Luminescence and triplet energy transfer in mixed crystals. II. Tree-component systems," *Aust. J. Chem.* **22**, N 10, 2085-90 (1969) (Eng).

AGRANOVICH, V. M., KAMENOGRADSKII, N. E., KONOBEEV, YU. V., "Theory of transfer of electron excitation energy between impurity molecules." *Fiz. Tverd. Tela* **II**, N 6, 1445–56 (1969) (Russ) (*P.A.* **70**: 11684).
BERNSTEIN, E. R., COLSON, S. D., TINTI, D. S. and ROBINSON, G. W., "Static crystal effects on the vibronic structure of the phosphorescence, fluorescence, and absorption spectra of benzene isotopic mixed crystals," *J. Chem. Phys.* **48**, N 10, 4632–59 (1968) (Eng).
BREE, A. and ZWARICH, R., "A study of biphehyl crystal phosphorescence induced by impurities," *Mol. Cryst. and Liq. Cryst.* **5**, N 4, 369–79 (1969) (Eng).
DAVYDOV, A. S., "The radiationless transfer of energy of electronic excitation between impurity molecules in crystals," *Phys. Status Solidi* **32**, N 2, 905–909 (1969) (Eng).
DE GROOT, M. S., HESSELMANN, I. A. M. and VAN DER WAALS, J. H., "Paramagnetic resonance in phosphorescent aromatic hydrocarbons. V. The benzene in perdeuterobenzene crystal," *Mol. Phys.* **16**, N 1, 45–60 (1969) (Eng).
DEXTER, D. L., FÖRSTER, TH. and KNOX, R. S., "The radiationless transfer of energy of electronic excitation between impurity molecules in crystals," *Phys. Status Solidi* **34**, N 2, K159–62 (1969) (Eng) (*P.A.* **70**: 8903).
DOBROVOL'SKAYA, O. V., PRIIMACHEK, V. R. and FAIDYSH, A. N., "Dependence of the sensitized luminescence of europium ions on the phase composition of benzophenone," *Optics and Spectrosc.* **26** N 3, 469–71 (1969) (Russ).
GACHKOVCKII, V. F., GAFUROV, K. M. and BERLIN, A. A., "Change in the luminescence spectra of anthracene and phenanthrene during doping by a paramagnetic impurity," *Zh. Strukt. Khim* **9**, N 1, 62–6 (1968) (Russ).
GERKIN, R. E. and WINER, A. M., "Deuterium isotope effect in zero-field splittings of phosphorescent phenanthrene oriented in biphenyl," *J. Chem. Phys.* **50**, N 7, 3114–5 (1969) (Eng) (*C.A.* **69**: 17352a).
GRIVET, J.-PH. "Electron spin resonance of phosphorescent anthracene," *Chem. Phys. Letters* **4**, N 2, 104–6 (1969) (Eng).
HAMMER, A. and WOLF, H. C., "Temperature dependence of sensitized fluorescence in naphthalene crystals," *Mol. Crys.* **4**, N 1–4, 191–3 (1968) (Eng) (*P.A.* **69**: 10245).
HANSON, D. M., "Phosphorescence spectrum, vibronic analysis, and lattice frequencies of the naphthalene molecule in a deuteronaphthalene crystal," *J. Chem. Phys.* **51**, N 11, 5063–9 (1969) (Eng).
KAMENOGRADSKII, N. E. and KONOBEEV, JU. V., "Effective quadrupole-quadrupole interaction between impurity molecules in a crystal," *Fiz. Tverd. Tela* **11**, N 8, 2357–60 (1969) (Russ) (*P.A.* **70**: 23932).
KAWAOKA, K., "Excited-state interactions and energy transfer in pyrene molecular crystals. Quenching of organic triplet states by molecular oxygen," *Diss. Abstr. B* **29**, N 1, 137–8 (1968) (Eng) (*C.A.* **69**: 91430d).
KAWSKI, A., "Remarks on the observed influence of temperature on the polarization of fluorescence of solid solutions," *Acta. Phys. Polon.* **35**, N 4, 863–4 (1969) (Ger) (*P.A.* **70**: 9032).
KINOSHITA, M. and MCGLYNN, S. P., "Delayed luminescence of organic mixed crystals. IV. Triplet-triplet annihilation phenomena," *Mol. Cryst.* **4**, N 1–4, 231–51 (1968) (Eng) (*P.A.* **69**: 16439).
MARTIN-BOUYER, M., "Electron energy transfers in doped durene single crystals," *J. Chim. Phys.* (France) **65**, N 11–12, 1949–56 (1968) (Fr).
NICKEL, B., STAERK, H. and WELLER, A., "Energy transfer from absorbed dye molecules to anthracene single crystals," *Chem. Phys. Letters* **4**, N 1, 27–30 (1969) (Eng) (*P.A.* **70**: 5023).
OKUNEVA, M. M., "Relaxation of local excitation in crystal," *Vestn. Leningr. Univ., Fiz. Khim.*, N 16, 21–9 (1969) (Russ).
POWELL, R. C. and KEPLER, R. G., "Evidence for long-range exciton-impurity interaction in tetracene, doped anthracene crystals. (Erratum)," *Phys. Rev. Letters* **22**, N 22, 1232 (1969) (Eng).
ROSENSTOCK, H. B., "Luminescent emission from an organic solid with traps," *Phys. Rev.* **187**, N 3, 1166–8 (1969) (Eng) (*P.A.* **70**: 26069).
SPINIVASAN, B. N., KINOSHITA, M. and MCGLYNN, S. P., "Delayed luminescence of organic mixed crystals. VI. Delayed excimer fluorescence of pyrene in biphenyl," *J. Chem. Phys.* **47**, N 12, 5090–6 (1968) (Eng).
TOMKIEWICZ, Y. and LOEWENTHAL, E., "Interaction between pyrene and perylene in solid state," *Mol. Cryst. and Liq. Cryst.* **6**, N 2, 211–25 (1969) (Eng).
WATMANN-GRAJCAR, L., "Analysis of the fluorescence spectra of hydrogenated and deuterated toluenes and benzyl radicals in solid solution," *J. Chim. Phys. (France)* **66**, N 6, 1023–40 (1969) (Fr).
WEINREB, A. and LEIBOWITZ, M., "On the vacuum ultraviolet excited luminescence of pure and doped polystyrene," *Mol. Cryst.* **4**, N 1–4, 15–31 (1968) (Eng).
ZHEVANDROV, N. D., GRIBKOV, V. I., GORSHKOV, V. K., "Temperature dependence of the transfer of excitation energy and luminescent properties of an impurity in mixed molecular crystals," *Izv. Akad. Nauk. SSSR, Ser. Fiz* **32**, N 8, 1346–52 (1968) (Russ) (*C.A.* **69**: 7873r).

7. Exciton Problem of Molecular Crystals

7.1. Lattice Dynamics and Phonon Spectra

ACHAR, B. H. and BARSCH, G. R., "A modified formulation of lattice dynamics," *Phys. Status Solidi* **34** N 2, 609–20 (1969) (Eng) (*P.A.* **70**: 8202).
ALLNATT, A. R. and ROWLEY, L. A., "The statistical mechanics of imperfect molecular crystals," *J. Phys. Chem. Solids* **30**, N 9, 2187–99 (1969) (Eng).
BAGLIN, F. G., BUOH, S. F. and DURIG, J. R., "The lattice vibrations of molecular crystals. III. The spectrum, dynamics and lattice energy of the methylamine system," *Mol. Cryst. and Liq. Cryst.* **5**, N 4, 331–52 (1969) (Eng).
BALCOU, Y. and MEINNEL, J., "Molecular movements in crystalline fluorodurene," *C. R. Acad. Sci., Paris* **266B**, N 13, 852–4 (1968) (Fr).
BELLAMY, L. J. and OWEN, A. J., "A simple relationship between the infra-red stretching frequencies and the hydrogen bond distances in crystals," *Spectrochim. acta* **25A**, N 2, 329–33 (1969) (Eng).
BONDI, A., "Rotational diffusion rates in molecular crystals in relations to molecular structure and to crystal packing density," *Mol. Cryst.* **3**, N 4, 479–92 (1968) (Eng) (*P.A.* **68**: 48767).

BULKIN, B. J., GRUNBAUM, D. and SANTORO, A. V., " Vibrational spectra of liquid crystals. I. Changes in the infrared spectrum at the crystal-nematic transition," *J. Chem. Phys.* **51**, N 4, 1602–6 (1969) (Eng).
BULLOUGH, R. K. and OBADA, A.-S. F., " The binding energy of molecular crystals," *Chem. Phys. Letters* **3**, N 3, 177–81 (1969) (Eng).
BULLOUGH, R. K. and OBADA, A.-S. F., " Dielectric constants for the cubic molecular crystals," *Chem. Phys. Letters* **3**, N 2, 114–7 (1969) (Eng).
BURSTEIN, E., MILLS, D. L., PINCZUK, A. and USHIODA, S., " Exciton-enhanced Raman scattering by optical phonons," *Phys. Rev. Letters* **22**, N 8, 348-52 (1969) (Eng).
CAHILL, J. E., TREUIL, K. L., MILLER, R. E. and LEROI, G. E., " Combination of external with internal vibrations in molecular crystals," *J. Chem. Phys.* **49**, N 7, 3320–1 (1968) (Eng) (*C.A.* **69**: 15591$_h$).
CAHILL, J. E. and LEROI, G. E., " Raman spectra of solid chlorine and bromine," *J. Chem. Phys.* **51**, N. 10, 4514–19 (1969) (Eng) (*P.A.* **70**: 26061).
CAHILL, J. E. and LEROI, G. E., " Raman studies of molecular motion in condensed oxygen," *J. Chem. Phys.* **51**, N 1, 97–104 (1969) (Eng).
CHEN, S. H. and DVORAK, V., " Group-theoretical analysis of lattice vibrations in molecular crystals," *J. Chem. Phys.* **48**, N 9, 4060–3 (1968) (Eng) (*P.A.* **68**: 39861).
COHEN, M. H. and RUVALDS, J., " Two-phonon bound states," *Phys. Rev. Letters* **23**, N 24, 1378–81 (1969) (Eng) (*P.A.* **70**: 17963).
DARMON, I., BROT, C., CHANTRY, G. W. and GEBBIE, H. A., " Far infra-red spectra and the molecular vibrations in some crystalline hexasubstituted chloromethylbenzenes," *Spectrochim. Acta* **24A**, N 9, 1517–19 (1968) (Eng) (*P.A.* **69**: 24418).
DECIUS, J. C., " Dipolar coupling and molecular vibration in crystals. I. General theory," *J. Chem. Phys.* **49**, N 3, 1387–92 (1968) (Eng) (*P.A.* **69**: 3501)
DOLLING G., " Lattice dynamics of molecular solids." In *Molecular dynamics and structure of solids*, NBS Spec. Publ. 301, Gaithersburg, Md., USA, 16–19 Oct. 1967. Washington, DC., USA: U.S. Dept. Commerce June 1969, 289–314 (Eng) (*P.A.* **70**: 15012).
DUMAS, G. G., MARCOU, A., CHEDIN, M. P., FREYMANN, R., " Raman spectra and external frequencies of some benzene derivatives," *C. R. Acad. Sci., Paris* **267A**, and **B**, N 4, 267–9 (1968) (F_2). (*P.A.* **68**: 47637).
EGGER, H., GSÄNGER, M. and LÜSCHER, E., " Phonon dispersion measurements on an argon single crystal at 4.2 °K," *Phys. Letters* **28A**, N 6, 433–4 (1968) (Eng).
EISENRIEGLER, E., " Lattice dynamics of an isotopic defect," *Z. Physik.*, Bd. 222, Hf. 4, 341–57 (1969) (Ger).
EPSHTEIN, E. M., " Phonons in the field of a strong electromagnetic wave," *Fiz. Tverd. Tela* **11**, N 10, 2874–80 (1969) (Russ) (*P.A.* **70**: 31222).
GIGLIO, E., " Calculation of Van der Waals interactions and hydrogen bonding in crystals," *Nature* **222**, N 5191, 339–41 (1969) (Eng).
GOLDSCHMIDT, C. R., TOMKIEWICZ, Y. and BERLMAN, I. B., " An intermolecular interaction of excited states in crystals and liquids," *Chem. Phys. Letters* **2**, N 8, 520–2 (1968) (Eng).
HADNI, A., WYNCKE, B., MORLOT, G. and GERBAUX, X., " Translational frequencies of molecules in naphthalene, durene, and anthracene single crystals at low temperatures," *J. Chem. Phys.* **51**, N 8, 3514–19 (1969) (Eng).
HAMILTON, W. C., " Diffraction studies of molecular motion," *Mol. Cryst. and Liq. Cryst.* **9**, 11–24 (1969) (Eng).
HANSEN, J.-P., " Ground state of solid neon," *Phys. Rev.* **172**, N 3, 919–23 (1968) (Eng).
HANSON, D. M. and GEE, A. R., " Raman scattering tensors for single crystals of naphthalene," *J. Chem. Phys.* **51**, N 11, 5052–62 (1969) (Eng) (*P.A.* **70**: 28642).
IVANITSKII, P. G., KROTENKO, V. T., GORBACHEV, B. T., TSYBUL'NIK, A. N., " Inelastic scattering of slow neutrons in polyethylene at 290 and 100-deg.-K," *Ukr. Fiz. Zh.* **14**, N 9, 1525–8 (1969) (Ukr.).
KINGALEY, J. D., MAHAN, G. D. and KRAVITZ, L. C., " Background polarization corrections to the Davydov splittings of phosphate vibrations," *J. Chem. Phys.* **49**, N 10, 4610–17 (1968) (Eng) (*P.A.* **69**: 16176).
KITAIGORODSKII, A. I. and MUKHTAROV, E. I., " Calculation of a low vibration spectrum and characteristic temperature of a naphthalene crystal," *Kristallografiya* **14**, N 5, 784–7 (1969) (Russ).
KITAIGORODSKII, A. I., MIRSKAYA, K. V. and TOVBIS, A. B., " Energy of a crystalline benzene lattice in an atom-atom approximation," *Kristallografiya* **13**, N 2, 225–31 (1968) (Russ) (*P.A.* **68**: 35395).
KRUMHANSL, J. A. and WU, S. Y., " Solid molecular hydrogen as a quantum crystal," *Phys. Letters* **28A**, N 4, 263–4 (1968) (Eng) (*P.A.* **69**: 15436).
LAUFER, J. C., CAHILL, J. E. and LEROI, G. E., " Lattice vibrations in some simple molecular crystals." In *Molecular dynamics and structure solids*, NBS Spec. Publ. 301, Gaithersburg, Nd., USA, 16–19 Oct. 1967. Washington, DC., USA: U.S. Dept. Commerce June 1969, 327–9 (Eng) (*P.A.* 7015019)
LEAKE, J. A., DANIELS, W. B., SKALYO, J., JR., FRAZER, B. C. and SHIRANE, G., " Lattice dynamics of neon at two densities from coherent inelastic neutron scattering," *Phys. Rev.* **181**, N 3, 1251–60 (1969) (Eng).
LISITSA, M. P., KHARCHENKO, N. P., " Davydov splitting of vibrational absorption bands in solid solutions," *Zh. Prikl. Spectrosk* **8**, N 4, 667–70 (1968) (Russ).
LUCAS, A. A., " Effect of many-body Van der Waals forces on the lattice dynamics of rare-gas crystals," *Phys. Rev.* **176**, N 3, 1093–7 (1968) (Eng).
LUDWIG, W., " Phonons and their interactions," In *Lectures on elementary excitations and their interactions in solids*, Cortina d'Ampezzo, 11–23 Jul 1966, Cortina d'Ampezzo, Nato Advanced Study Institute (1968) (Eng) (*P.A* **70**: 1809).
MASON, R., " The intermolecular potential and structure of crystals of aromatic molecules," *Mol. Cryst. and Liq. Cryst.* **9**, 3–10 (1969) (Eng).
MIRSKAYA, K. V., KOZLOVA, I. E., " Calculation of the structure and energy surface of the lattices of naphthalene and anthracene crystals," *Kristallografiya* **14**, N 3, 412–6 (1969) (Russ).
NERYCHEV, U. A., ZOTOV, V. V. and OTPUSHCHENNIKOV, N. F., " Speed of sound in a homologous series of *n*-paraffins," *Zh. Fiz. Khim.* **43**, N 11, 2843–5 (1969) (Russ).
NOOLANDI, J. and VAN KRANENDONK, J., " Interaction of the lattice vibrations with the rotational excitations in solid H_2," *Phys. Letters* **30A**, N 4, 258–9 (1969) (Eng) (*P.A.* **70**: 11888).
OLIVER, D. A. and WALMSLEY, S. H., " Torsional lattice vibrations in molecular crystals. II. Benzene," *Mol. Phys.* **17**, N 6, 617–26 (1969) (Eng) (*P.A.* **70**: 8217).

PAWLEY, G. S. and YEATS, E. A., " Low frequency phonons in naphthalene," *Solid State Communs* **7**, N 3, 385–8 (1969) (Eng) (*P.A.* **69**: 19854).
PHILLIPS, J. C. and VAN VECHTEN, J. A., " Dielectric classification of crystal structures, ionization potentials, and band structures," *Phys. Rev. Letters* **22**, N 14, 705–8 (1969) (Eng).
RAE, A. I. M. and MASON, R., Comment on " Sublimation energy of benzene," *J. Chem. Phys.* **50**, N 7, 3134–5 (1969) (Eng)
RAE, A. I. M. and MASON, R., " The intermolecular potential and the lattice energy of benzene," *Proc. Roy. Soc.* **A, 304,** N 1479, 487–99 (1968) (Eng).
REINSBOROUGH, V. C., " Physical chemistry of molten organic salts," *Rev. Pure. Appl. Chem.* **18**, Dec. 281–90 (1968) (Eng).
ROSENSTOCK, H. B. and MCGILL, R. E., " Vibrations of disordered solids," *Phys. Rev.* **176**, N 3, 1004–14 (1968) (Eng).
SAVOIE, R. and PÉZOLET, M., " Longitudinal modes in Raman spectra of molecular crystals," *J. Chem. Phys.* **50**, N 6, 2781–2 (1969) (Eng).
SEN, P. and BASU, S., Comment on " Sublimation energy of benzene," *J. Chem. Phys.* **50**, N 7, 3135 (1969) (Eng).
SHERWOOD, J. N., " Lattice defects in organic crystals," *Mol. Cryst. and Liq. Cryst.* **9**, 37–57 (1969) (Eng).
SMITH, F. C., Jr. and JOHNSON, K. H., " Scattering model of molecular electronic structure," *Phys. Rev. Letters* **22**, N 22, 1168–71 (1969) (Eng).
SUN, YAO, H. Y. and YAO, S. J., " Second-order calculation of vibrational energy transfer," *J. Chem. Phys.* **51**, N 7, 2961–7 (1969) (Eng).
TABOR, D. F. R. S. and WINTERTON, R. H. S., " The direct measurement of normal and retarded Van der Waale forces," *Proc. Roy. Soc. A* **312**, N 1511, 435–50 (1969) (Eng).
TADDEI, G. and CALIFANO, S., " Intermolecular forces and vibrations of molecular crystals," *Rivista. Nuovo Cimento* **1**, N 4, 547–68 (1969) (Eng) (*P.A.* **70**: 43841).
THAPER, C. L., SEQUEIRA, A., DASANNACHARYA, B. A. and LYENGAR, P. K., " Neutron inelastic scattering studies in crystal hydrates," *Phys. Stat. Solidi* **34**, N 1, 279–91 (1969) (Eng) (*P.A.* **69**: 42955).
TREVINO, S. F., " Neutron spectroscopy: comparison with Raman and infrared," *Appl. Spectrosc.* **22**, N 6, 659–74 (1968) (Eng) (*C.A.* **69**: 42381a).
TSENEVA, M. A., " Polymorphic transformations in organic crystals," *Dokl. Acad. Nauk. SSSR* **185**, N 2, 302–5 (1969) (Russ).
VAN STEENWINKEL, R., " The spin lattice relaxation of the nuclear dipolar energy in some organic crystals with slow molecular motions," *Z. Naturforsch.* **24A**, N 10, 1526–31 (1969) (Eng) (*P.A.* **70**: 18561).
VINOGRADOV, V. S., " Local vibrations and optical phonons in solid solutions," *Fiz. Tverd. Tela* **11**, N 8 2062–71 (1969) (Russ).
WAGNER, M., Investigation of lattice dynamics by means of vibronic spectra," *Z. Phys.* **214**, N 1 78–107 (1968) (Eng) (*P.A.* **68**: 39859).
WALMSEY, S. H., " The calculation of properties of molecular crystals using a pair potential function," In *Excitons, magnons and phonons in molecular crystals*, Beirut, Lebanon 15–18 Jan 1968. London, England: Cambridge, 83–96 (Eng) (*P.A.* **70**: 11891).
WALMSLEY, S. H., " Central force field approximation for the calculation of displacement lattice vibrations molecular crystals," *Molec. Phys.* **14**, N 2, 165–70 (1968) (Eng) (*P.A.* **68**: 30926).
WALMSLEY, S. H., " Lattice vibrations and elastic constants of molecular crystals in the pair potential approximation," *J. Chem. Phys.* **48**, N 4, 1438–44 (1968) (Eng) (*P.A.* **68**: 30925).
WANG, C.-S., " Theory of stimulated Raman scattering," *Phys. Rev.* **182**, N 2, 482–94 (1969) (Eng).
WEULERSSE, P., " Calculation of external infrared frequencies of naphthalene and anthracene crystals," *C. R. Acad. Sci., Paris* **268 A** and **B**, N 22, 1440–2 (1969) (Fr) (*P.A.* **70**: 2306).
WHALLEY, E. and LABBE, H. J., " Optical spectra of orientationally disordered crystals. III. Infrared spectra of the sound waves," *J. Chem. Phys.* **51**, N 7, 3120–7 (1969) (Eng).
WHITE, J. W., " Density of states measurements for optical and acoustic phonons by neutron-scattering spectroscopy," In *Excitons, magnons and phonons in molecular crystals*, Beirut, Lebanon, 15–18 Jan 1968, London, Cambridge, 43–82 (1968) (Eng) (*P.A.* **70**: 11893).
WOLKERSTORJER, D. C., " Raman-nath diffraction in organic crystals," *Appl. Phys. Letters* **14**, N 10, 323–5 (1969) (Eng).
ZORKIN, P. M., " Structure of molecular crystals. Potential function symmetry method for asymmetrical, congruently equal molecules," *Kristallografiya* **13**, N 1, 26–32 (1968) (Russ) (*P.A.* **68**: 34391).

7.2. Singlet Excitons

AGRANOVICH, V. M., DORONINA, V. I. and KONOVEEV, YU. V., " Annihilation of singlet excitons in anthracene with subsequent calculation of reabsorption," *Fiz. Tverd. Tela* **11**, N 9, 2608–11 (1969) (Russ).
AKIMOTO, O. and HASEGAWA, H., " Strain-induced splitting and polarization of excitons due to exchange interaction," *Phys. Rev. Letters* **20**, N 17, 916–18 (1968) (Eng) (*P.A.* **68**: 26920).
BENSING, J. L. and PYSH, E. S., " Higher energy excitons in polypeptide films," *Chem. Phys. Letters* **4** N 3, 120–2 (1969) (Eng) (*P.A.* **70**: 8343).
BOSNICH, B., " The application of exciton theory to the determination of the absolute configurations of inorganic complexes," *Accounts of Chemical Research* **2**, N 9, 266–73 (1969) (Eng).
BROUDE, V. L., " Electron terms of crystals of deutero benzenes and their mixtures," *Fiz. Tverd Tela* **11**, N 5, 1159–67 (1969) (Russ).
CHOJNACKI, H. and GOLEBIEWSKI, A., " Band structure and current carriers mobilities in imidazole crystal," *Mol. Cryst. and Liq. Cryst.* **5**, N 4, 317–30 (1969) (Eng).
CRAIG, D. P. and DISSADO, L. A., "Exciton damping." In *Excitons, magnons and phonons in molecular crystals*, Beirut, Lebanon, 15–18 Jan 1968. London, England, Cambridge, 203–12 (1968) (Eng) (*P.A.* **70**: 12467).
CRAIG, D. P. and DISSADO, L. A., " Radiation damping of exciton states," *J. Chem. Phys.* **48**, N 1, 516–17 (1968) (Eng) (*P.A.* **68**: 22477).

DAVYDOV, A. S., " Deformation of molecular crystals at electronic excitation," *Phys. Status Solidi* **36**, N 1, 211–19 (1969) (Eng) (*P.A.* **70**: 18094).
EVANS, B. L., YOUNG, P. A., " Delocalized excitons in thin anisotropic crystals," *Phys. Status Solidi* **25**, N 1, 417–25 (1968) (Eng) (*P.A.* **68**: 13679).
FISCHER, A. and RICE, S. A., " Study of exciton dynamics in a simple liquid," *Phys. Rev.* **176**, N 1, 409–19 (1968) (Eng).
GERLACH, E., " Surface states of anthracene crystals," *Phys. Rev.* **183**, N 3, 807–8 (1969) (Eng).
HAENSEL, R., KEITEL, G., KOCH, E. E., SKIBOWSKI, M. and SCHREIBER, P., " Reflection spectrum of solid argon in the vacuum ultraviolet," *Phys. Rev. Letters* **23**, N 20, 1160–3 (1969) (Eng).
HANSON, D. M., KOPELMAN, R. and ROBINSON, G. W., " Information on the exciton band structure of the B_{2u} state of crystalline naphthalene from the variation of energy denominators method," *J. Chem. Phys.* **51**, N 1, 212–23 (1969) (Eng) (*P.A.* **70**: 1895).
HARPER, P. G. and HILDER, J. A., " Exciton spectra in thin crystals," *Phys. Status Solidi* **26**, N 1, 69–76 (1968) (Eng) (*P.A.* **68**: 22475).
HAUG, H., " Theory of laser action involving *free* excitons and LO-phonon-assisted transitions," *J. Appl. Phys.* **39**, N 10, 4687–95 (1968) (Eng) (*C.A.* **69**: 101699*q*).
HOPFIELD, J. J., " Free and bound excitons." In *Lectures on elementary excitations and their interactions in solids*, Cortina d'Ampezzo 11–23 Jul 1966. Cortina d'Ampezzo, Nato Adavanced Study Institute (1968) (Eng) (*P.A.* **70**: 1893).
HUANG, C.-Y., " Isotope effect in crystal-field splitting," *Phys. Rev.* **168**, N 2, 334–6 (1968) (Eng).
ITOH, M., " Exciton splitting of absorption spectra in radical dimers," *Chem. Phys. Letters* **2**, N 6, 371–3 (1968) (Eng).
JELITTO, R. J., " The density of states of some simple excitations in solids," *J. Phys. Chem. Solids* **30**, N 3, 609–26 (1969) (Eng).
KUBAREV, S. I., PONOMAREV, O. A., " Calculation of the zone structure and deformation potentials of phthalocyanines," *Teor. Eksp. Khim.* **4**, N 4, 498–507 (1968) (Russ).
KÜBLER, J., " Exciton resonances in insulators," *Z. Phys.* **208**, N 3, 249–65 (1968) (Eng) (*P.A.* **69**: 8947).
KUNDRAT, V., " Exciton effects in the inter-band absorption of insulators," *Czechosl. J. Phys.* **B18**, N 8 1003–7 (1968) (Eng) (*P.A.* **69**: 1572).
MANELIS, G. B., STRUNIN, V. A., " Zonal mechanism of the development of solid phase reversible reactions," *Dokl. Akad. Nauk SSSR* **187**, N 2 362–3 (1969) (Russ).
MERRIFIELD, R. E., AVAKIAN, P. and GROFF, R. P., " Fission of singlet excitons into pairs of triplet excitons in tetracene crystals " *Chem. Phys. Letters* **3**, N 3 155–7 (1969) (Eng).
MERRIFIELD, R. E., AVAKIAN, P. and GROFF, R. P., " Fission of singlet excitons into pairs of triplet excitons in tetracene crystals," *Chem. Phys. Letters* **3**, N 6, 386–8 (1969) (Eng) (*P.A.* **69**: 49007).
MIYAKAWA, T., " Excitons and plasmons in insulators," *J. Phys. Soc. Jap.* **24**, N 4, 768–86 (1968) (Eng) (*P.A.* **68**: 35949).
MUDLER, B. J., " Diffusion and surface reactions of singlet excitons in anthracene," *Philips. Res. Rep. Suppl*, N 4, 128 pp. (1968) (Eng) (*C.A.* **69**: 33051r).
MUTO, T., " On exciton phenomena," *Solid State Phys.* **4**, N 11, 618–28 (1969) (Eng) (*P.A.* **70**: 41925).
NAGAEV, E. L., " Exciton, polarons and plasma—exciton waves," *Zh. Eksp. Teor. Fiz.* **57**, N 2, 469–77 (1969) (Russ).
NAKAO, K., KAMIMURA, H. and NISHINA, Y., " Theory of the two-dimensional indirect exciton in anisotropic crystals," *Nuovo cimento* **63B**, N 1, 45–53 (1969) (Eng) (*P.A.* **70**: 12041).
OBUKHOVSKII, V. V. and STRIZHEVSKII, V. L., " Parametric luminescence in crystals involving polarition excitation," *Zh. Eksp. and Teor. Fiz.* **57**, N 2, 520–8 (1969) (Russ).
ONISHCHUK, V. A., " Molecular crystal excitons with allowance for the retarded interaction," *Ukr. Fiz. Zh.* **13**, N 7, 1067–71 (1968) (Russ) (*P.A.* **68**: 49110).
PHILLIPS, J. C. and VAN VECHTEN, J. A., " Dielectric classification of crystal structures, ionization potentials and band structures," *Phys. Rev. Letters* **22**, N 14, 705–8 (1969) (Eng).
PHILPOTT, M. R., " Dipole Davydov splittings in crystalline anthracene, tetracene, naphthalene, and phenanthrene," *J. Chem. Phys.* **50**, N 12, 5117–28 (1969) (Eng) (*P.A.* **69**: 49006).
PHILPOTT, M. R., " Exciton-ptoton coupling in crystalline anthracene," *J. Chem. Phys.* **50**, N 9, 3925–9 (1969) (Eng) (*P.A.* **69**: 39571).
PIMENOV, U. D., " Creation of surface excitonic states by the absorption of organic molecules," *Vestn. Lening. Univ.*, N 10, 69–72 (1968) (Russ).
POPE, M., " Charge-transfer exciton state, ionic energy levels, and delayed fluorescence in anthracene,', *Mol. Cryst.* **4**, N 1–4, 183–90 (1968) (Eng) (*P.A.* **69**: 16437).
POPE, M. and GEACINTOV, N. E., " Excitement in excitons," *Ind. Res.* **11**, N 9. 68–70 (1969) (Eng).
POPE, M., GEACINTOV, N. E. and VOGEL, F., " Singlet exciton fission and triplet-triplet exciton fusion in crystalline tetracene," *Mol. Cryst. and Liq. Cryst.* **6**, N 1, 83–104 (1969) (Eng).
PRIIMACHEK, V. P. and FAIDYSH, A. N., " Effect of exciting light intensity on the interaction of singlet and triplet excitons with impurity molecules in naphthalene crystals," *Optics and Spectrosc.* **27**, N 3, 431–8 (1969) (Russ) (*P.A.* **70**: 44898).
RAZ, B. and JORTNER, J., " Trapped exciton state in liquid argon," *J. Chem. Phys.* **49**, N 7, 3318–20 (1968) (Eng) (*C.A.* **69**: 15677v).
RUSIN, B. A. and FRANKEVICH, E. L., " Change of the concentration of Wannier excitons in molecular crystals caused by a magnetic field," *Phys. Status Solidi* **33**, N 2, 885–95 (1969) (Eng) (*P.A.* **69**: 39570).
SUGAKOV, V. I., " Surface excitons in molecular crystals with two molecules in the unit cell," *Ukr. Fiz. Zh.* **14**, N 9, 1425–9 (1969) (Russ).
TAKAHASHI, Y. and TOMURA, M., " Drift time due to diffusion of singlet excitions in anthracene crystals," *J. Phys. Soc. Jap.* **27**, N 5, 1369 (1969) (Eng) (*P.A.* **70**: 25757).
TANAKA, M. and TANAKA, J., " Theory of the exciton states of molecular crystals," *Mol. Phys.* **16**, N 1, 1–15 (1969) (Eng) (*P.A.* **69**: 31617).
TOMURA, M. and TAKAHASHI, Y., " A note of measurements of the diffusion coefficient of singlet excitons in anthracene crystals," *J. Phys. Soc. Jap.* **26**, N 5, 1325 (1969) (Eng).
UUMON SADZJN, " Excitation and decay of excitons," *Butsuri* **24**, N 11, 742–5 (1969) (Japan).
WALMSLEY, S. H., " The calculation of properties of molecular crystals using a pair potential function." *Excitons, magnons and phonons in molecular crystals*, Beirut, Lebanon, 15–18 Jan 1968. London, England: Cambridge, 83–96 (1968) (Eng) (*P.A.* **70**: 11891).

WILLIAMS, F. W. and MATTHEWS, N. F. J. I., " Energy bands in one-dimensional aperiodic crystals,' *Phys. Rev.* **180**, N 3, 864–72 (1969) (Eng).

7.3. Triplet Excitons

BAESSLER, H., " Migration of triplet excitons in molten naphthalene," *Mol. Cryst.* **4**, N 1–4, 201–12 (1968) (Eng).
CLARKE, R. H. and HOCHSTRASSER, R. M., " Polarization of transitions to the magnetic substates of triplet excitons," *J. Chem. Phys.* **48**, N 4, 1745–8 (1968) (Eng) (*P.A.* **68**: 31296).
DUROCHER, D. F., WILLIAMS, D. F., " Temperature dependence of triplet diffusion in anthracene," *J. Chem. Phys.* **51**, N 4, 1675–6 (1969) (Eng) (*P.A.* **70**: 12046).
GAYEVSKY, A. S., ROSKOLODKO, V. G. and FAIDYSH, A. N., " Diffusion on of triplet excitons and their interaction with impurity molecules in crystalline and vitreous benzophenone," In *Proc. Int. Conf. Luminescence.* Budapest, 1966, **1** and **2**. Budapest, Akademiai Kiado, 486–8 (1968) (Eng) (*P.A.* **70**: 12603).
GAEVSKII, A. S., FAIDYSH, A. N., " Effect of the intensity of exciting light on the interaction of triplet excitons with molecules of an impurity in benzophenone crystals," *Izv. Akad. Nauk SSSR, ser. Fiz.* **32**, N 8, 1294–8 (1968) (Russ).
GAEVSKII, A. S., PRIIMACHEK, V. R. and FAIDYSH, A. N., " Interaction of triplet excitons with excited molecules of naphthalene and deuterio naphthalene in benzophenone crystals," *Izv. Vyssh. Ucheb. Zaved., Fiz.* N 8, 12–16 (1969) (Russ).
GONDO, Y. and MAKI, A. H., " Triplet-state zero-field splittings in some aromatic hydrocarbons and nitrogen heterocycles," *J. Chem. Phys.* **50**, N 8, 3270–9 (1969) (Eng) (*P.A.* **69**: 42425).
GOODE, D. H., " Effect of triplet exciton trap saturation and bimolecular decay on the delayed fluorescence of anthracene," In *Molec. Lumin. Int. Conf. 1968*, New York. W. A. Benjamin, 751–63 (1969) (Eng) (*C.A.* **69**: 26358).
HAARER, D. and WOLF, H. C., " Spin relaxation and optical spin polarisation of triplet excitons in naphthalene," *Phys. Status Solidi* **33**, N 2, K117–20 (1969) (Eng) (*P.A.* **69**: 39915).
HAUG, H., " Theory of laser action involving free excitons and LO-phonon-assisted transitions," *J. Appl. Phys.* **39**, N 10, 4687–95 (1968) (Eng).
KLOEPFFER, W., " Fluorescence studies of excitons of poly (vinyl carbazole)," *Ber. Bunsenges. Phys. Chem.* **73**, 864–7 (1969) (Ger).
KOYANAGI, M., SHIGEOKA, T. and KANDA, Y., " Exciton migration in triplet states of pyrazine and deuterated pyrazines in the crystal," In *Molec. Lumin., Int. Conf. 1968*, New York, W. A. Benjamin, 765–72 (1969) (Eng) (*C.A.* **69**: 26357n).
MERRIFIELD, R. E., AVAKIAN, P. and GROFF, R. P., " Fission of singlet excitons into pairs of triplet excitons in tetracene crystals," *Chem. Phys. Letters* **3**, N 3, 155–7 (1969) (Eng).
MERRIFIELD, R. E., AVAKIAN, P. and GROFF, R. P., " Fission of singlet excitons into pairs of triplet excitons in tetracene crystals, *Chem. Phys. Letters* **3**, N 6, 386–8 (1969) (Eng) (*P.A.* **69**: 49007).
POPE, M., GEACINTOV, N. E. and VOGEL, F., " Singlet exciton fission and triplet-triplet exciton fusion in crystalline tetracene," *Mol. Cryst. and Liq. Cryst.* **6**, N 1, 83–104 (1969) (Eng).
PRIIMACHEK, V. P. and FAIDYSH, A. N., " Effect of exciting light intensity on the interaction of singlet and triplet excitons with impurity molecules in naphthalene crystals," *Optics and Spectrosc.* **27**, 431–8 (1969) (Russ) (*P.A.* **70**: 44898).
RUMYANTSEV, B. M., FRANKEVICH, E. L., " Interaction of charge transfer excitons and triplet molecular excitons in anthracene," *Optiks. and Spectrosk.* **27**, N 5, 784–9 (1969) (Russ) (*P.A.* **70**: 44914).
SHAIN, A. L., ACKERMAN, J. P. and TEAGUE, M. W., "Intramolecular triplet exciton transfer in some noncoplanar aromatic systems," *Chem. Phys. Letters* **3**, N 7, 550–1 (1969) (Eng) (*P.A.* **70**: 6958).
SOOS, Z. G., " Zeeman populations of optically produced triplet excitons in anthracene," *J. Chem. Phys.* **51**, N 5, 2107–12 (1969) (Eng) (*P.A.* **70**: 15130).
SWENBERG, C. E., " Theory of triplet exciton annihilation in polyacene crystals," *J. Chem. Phys.* **51**, N 5, 1753–64 (1969) (Eng) (*P.A.* **70**: 21028).
VAUBEL, G. and KALLMANN, H., " Diffusion length and lifetime of triplet excitons and crystal absorption coefficient in tetracene determined from photocurrent measurements," *Phys. Status Solidi* **35**, 789–92 (1969) (Eng) (*P.A.* **70**: 12242).

7.4. Exciton-phonon Interaction (Shape of Bands, Energy Dissipation, Vibronic Spectra)

BASHCHEVSKII, B. U., " Use of Urbach's rule," *Fiz. Tverd. Tela* **11**, N 10, 2745–8 (1969) (Russ).
BRON, W. E., " Vibronic spectra and the shell models," *Phys. Rev.* **185**, N 3, 1163–7 (1969) (Eng).
BURNSTEIN, E. and MILLS, D. L., " Polaritons: coupled photon-polarization excitation modes. III." *Comments Solid State Phys.* **11**, N 4, 111–18 (1969) (Eng).
DAVYDOV, A. S., MYASNIKOV, E. N., " Depolarization of absorption bands in molecular crystals," *Ukr. Fiz. Zh.* **14**, 1484–92 (1969) (Russ).
DAVYDOV, A. S., " The theory of the Urbach's rule," *Ukr. Fiz. Zh.* **13**, N 8, 1327–32 (1968) (Russ).
DAVYDOV, A. S., " Theory of Urbach's rule," *Phys. Status Solidi* **27**, N 1, 51–6 (1968) (Eng).
DOLGANOV, V. K., SHEKA, E. F., " Anomalies of vibronic absorption in impurity deuterio benzene crystals," *Fiz. Tverd. Tela*, **11**, 2427–34 (1969) (Russ).
DUNN, D., " Urbach's rule in an electron-phonon model," *Phys. Rev.* **174**, N 3, 855–8 (1968) (Eng).
ELLIOTT, R. A., LAKATOS, K. and KNOX, R. S., " The effect of lattice vibrations on trap-limited exciton lifetimes," *J. Statist. Phys.* **1**, N 2, 253–70 (1969) (Eng) (*P.A.* **70**: 21027).
FANCONI, B. M., " Exciton-molecular vibration interaction in molecular crystals in the strong coupling limit," *Diss. Abstr.* B, **29**, N 3, 959 (1968).
FANCONI, B. M., GERHOLD, G. A. and SIMPSON, W. T., " Influence of exciton-phonon interaction on metallic reflection from molecular crystals," *Mol. Cryst. and Liq. Cryst.* **6**, N 1, 41–81 (1969) (Eng).
FEDOSSEV, V. and HIZHNYAKOV, V., " On the theory of low-temperature exciton absorption spectra," *Phys. Status Solidi* **27**, N 2, 751–5 (1968) (Eng) (*P.A.* **68**: 40258).
GOSAR, P. and SANG-IL CHOI, " Properties of narrow band and small polaron propagators," In *Excitons, magnons and phonons in molecular crystals*, Beirut Lebanon, 15–18 Jan 1968. London, England, Cambridge, 175–84 (1968) (*P.A.* **70**: 12044).
HAKEN, H. and REINEKER, P., " Comments on the interaction of excitons and phonons." In: *Excitons, magnons and phonons in molecular crystals*, Beirut, Lebanon, 15–18 Jan 1968. London, England, Cambridge, 185–94 (1968) (*P.A.* **70**: 12045).

KARTHEUSER, E., EVRARD, R. and DEVREESE, J., " Mechanism of absorption of light by free continuum polarons," *Phys. Rev. Letters* **22**, N 3, 94–7 (1969) (Eng).
LUBCHENKO, A. F., " Theory of Urbach's rule for impurity centres," *Phys. Status Solidi* **27**, N 1, K73–6 (1968) (Eng).
MATTHEW, J. A. D. and HART-DAVIS, A., " Theory of isotopic effects in the electron-phonon interaction," *Phys. Rev.* **168**, N 3, 936–46 (1968) (Eng).
MAVROYANNIS, C. and PATHAK, K. N., " Excitation spectrum of interacting polaritons in dielectric crystals," *Phys. Rev.* **182**, N 3, 872–84 (1969) (Eng).
MITRA, T. K., " Electron-phonon interaction in the modified light binding approximation," *Proc. Phys. Soc.*, London," *Solid State Phys.* Ser 2, **2**, N 1, 52–60 (1969) (Eng).
MJASNIKOV, E. I., " About exciton-phonon interaction in molecular crystals," *Ukr. Fiz. Zh.* **14**, N 7, 949–55 (1969) (Russ).
MOLCHANOV, A. G., " Selection rules for longitudinal scattering of excitons by phonons in optically active crystals," *Fiz. Tverd. Tela* **11**, N 5, 1184–7 (1969) (Russ).
MOSKALENKO, S. A., SHMIGLYUK, M. I., CHINIK, B. I., " Influence of optical phonons on the profile of Wannier-Mott exciton absorption bands," *Fiz. Tverd. Tela* **10**, N 2, 351–8 (1968) (Russ).
NITSOVICH, B. M., " The absorption of light in molecular crystals on the formation of excitons with negative effective masses," *Ukr. Fiz. Zh.* **14**, N 12, 2078–80 (1969) (Russ) (*P.A.* **70**: 26035).
NITSOVICH, B. M., " Light absorption by molecular crystals," *Ukr. Fiz. Zh.* **14**, N 7, 1013–18 (1969) (Russ) (*P.A.* **69**: 43234).
MEL'NIKOV, V. I., RASHBA, E. I., " Bound polaron and phonon states," *Pis'ma Zh. Eksper. Teor. Fiz.* **10**, N 2, 95–8 (1969) (Russ) (*P.A.* **70**: 12047).
PHILPOTT, M. R., " Theory of the vibrational structure of molecular excitons. Soluble one-phonon models," *J. Chem. Phys.* **51**, N 6, 2616–24 (1969) (Eng).
PHILPOTT, M. R., " Vibronic coupling in the exciton states of the rigid-lattice model of molecular crystals," *J. Chem. Phys.* **47**, N 11, 4437–45 (1968) (Eng) (*P.A.* **68**: 13670).
SCHMIDT, P. P., " The interaction between Mott-Wannier excitons in a vibrating lattice," *J. Phys. C. (Solid State Phys.)*, Ser. 2, **2**, N 5, 785–95 (1969) (Eng) (*C.A.* **69**: 33234).
SHEKA, E. F., *Electronic-vibrational spectra of molecules and crystals*, Preprint of the Institute of Solid State Physics, Moscow, 1969 (Russ).
SHRIVASTAVA, K. N., " Phonon-induced shift in optical absorption," *J. Phys. C. (Solid State Phys.)* **2**, ser 2, N 12, 2428–30 (1969) (Eng) (*P.A.* **70**: 31643).
STONEHAM, A. M., " Shapes of inhomogeneously broadened resonance lines in solids," *Rev. Modern Phys.* **41**, N 1, 82–108 (1969) (Eng).
TOYOZAWA, Y. and HERMANSON, J., " Exciton-phonon bound state: a new quasiparticle," *Phys. Rev. Letters* **21**, N 24, 1637–41 (1968) (Eng) (*P.A.* **69**: 12319).
ZGIERSKI, M. Z., " Energy renormalization of excitons due to weak-coupling interactions with intramolecular vibrations," *Acta phys. polon* **36**, N 2, 159–65 (1969) (Eng) (*P.A.* **70**: 18092)
ZGIERSKI, M. Z., " Quadratic weak vibronic coupling in molecular crystals," *Acta phys. polon* **36**, N 2, 167–70 (1969) (Eng).
ZGIERSKI, M. Z., " Towards the theory of vibronic coupling in molecular crystals," *Phys. Letters* **30A**, N 6, 354–5 (1969) (Eng) (*P.A.* **70**: 17038).

7.5. Excitons in Impurity Mixed Crystals.

ANDREEV, A. F. and LIFSHITS, I. M., " Quantum theory of crystal defects," *Zh. Eksp. Teor. Fiz.* **56**, N 6, 2057–68 (1969) (Russ).
BROUDE, V. L., " Electron terms of crystals of deutero benzenes and their mixtures," *Fiz. Tverd. Tela* **11**, N 5, 1159–67 (1969) (Russ).
COHEN, M. H. and JORTNER, J., " Electron cavity formation in solid helium," *Phys. Rev.* **180**, N 1, 238–41 (1969) (Eng).
CRAIG, D. P. and DACRE, P. D., " Retarded interactions in mixed crystal spectra," *Proc. Roy. Soc. ser. A*, **310**, N 1502, 297–312 (1969) (Eng) (*P.A.* **69**: 35643).
DOLGANOV, V. K. and SHEKA, E. F., " Anomalies of vibronic absorption in impurity deuterobenzene crystals," *Fiz. Tverd. Tela* **11**, N 9, 2427–34 (1969) (Russ).
HOPFIELD, J. J., " Free and bound excitons," *Lectures on elementary excitations and their interactions in solids*, Cortina d'Ampezzo 11–23 Jul 1966. Cortina d'Ampezzo, Nato Advanced study Institute 1968, 30 p. (Eng) (*P.A.* **70**: 1893).
JONES, R. and LUKES, T., " A path integral approach to disordered systems," *Proc. Roy. Soc., Ser. A*, **309**, N 1499, 457–72 (1969) (Eng).
KVENTSEL, G. F., " Local electron states in restricted polyene chains," *Teor. Eksp. Khim.* **4**, N 3, 291–298 (1968) (Russ).
KUBAREV, S. I. and MIKHAILOV, I. D., " Impurity and ' surface ' states in linear molecular systems," *Teor. Eksp. Khim.* **5**, N 5, 646–56 (1969) (Russ).
LUBCHENKO, A. F., " Theory of Urbach's rule for impurity centres," *Phys. Status Solidi* **27**, N 1, K73–6 (1968) (Eng).
NICOLIS, G., RICE, S. A. and JORTNER, J., " Optical model calculation of the electronic states of mixed disordered systems," *J. Chem. Phys.* **48**, N 8, 3544–51 (1968) (Eng) (*P.A.* **68**: 39293).
OSAD'KO, I. S., " Absorption of light by defect levels in molecular crystals," *Fiz. Tverd. Tela* **11**, N 2, 441–50 (1969) (Russ).
OSAD'KO, I. S., " Discrete and zone states in mixed molecular crystals," *Ukr. Fiz. Zh.* **13**, N 9, 1443–52 (1968) (Ukrain) (*P.A.* **69**: 5622).
OSAD'KO, I. S., " Discrete states in mixed molecular crystals with complicated lattice cell," *Ukr. Fiz. Zh.* **13**, N 8, 1292–303 (1968) (Ukr.).
OSTAPENKO, N. I. and SHPAK, M. T., " Local exciton states in a benzene crystal with thiophene, furan, and pyrrole impurities," *Izv. Akad. Nauk SSSR, Ser. Fiz.* **32**, N 8, 1390–3 (1968) (Russ).
OSTAPENKO, N. I. and SHPAK, M. T., " Localized exciton states of doped naphthalene crystals," *Phys. Status Solidi* **36**, N 2, 515–24 (1969) (Eng) (*P.A.* **70**: 18097)
PEUKER, K., " Density matrix method in the theory of optical spectra of impurities in solids," *Phys. Status Solidi* **31**, N 1, 363–73 (1969) (Eng).

REBANE, K. K., " Theory of the vibrational structure of the spectra of crystals with impurities," *Proc. Int. Conf. Luminescence. Budapest, 1966*, 1, and 2. Budapest, Akademiai Kiado, 124–33 (1968) (Eng) (*P.A.* **70**: 12453).
REMYGA, S. A., MYASNIKOVA, R. M. and KITAIGORODSKII, A. I., " Example of a mixed binary molecular crystal with double statistical disorder in the arrangement of molecules," *Zh. Strukt. Khim.* **10**, N 6, 1131–3 (1969) (Russ).
SCHRUM, D. C. and PEAT, F. D., " Localized states of a one-dimensional crystal model," *Physica* **39**, N 1, 94–106 (1968) (Eng).
SOMMER, B.-S. and JORTNER, J., " Impurity pairs in mixed molecular crystals," *J. Chem. Phys.* **51**, N 12, 5559–65 (1969) (Eng) (*P.A.* **70**: 28253).
SUGAKOV, V. I., " About exciton luminescence in imperfect crystals," *Optics and Spectrosc.* **26**, N 5, 732–9 (1969) (Russ).
SUGAKOV, V. I., " Dispersion and attenuation of electromagnetic waves in mixed molecular crystals," *Fiz. Tverd. Tela* **10**, N 10, 2995–3004 (1968) (Russ).
SUGAKOV, V. I. and TOVSTENKO, V. I., " Effect of the surface on impurity states in molecular crystals," *Fiz. Tverd. Tela* **11**, N 5, 1425–7 (1969) (Russ).
SUGAKOV, V. I., " Local states and effects of retardation," *Optics and Spectrosc.* **24**, N 4, 477–86 (1968) (Russ).
SUGAKOV, V. I. and TOVSTENKO, V. I., " Scattering of light excitons by impurity centres in molecular crystals," *Ukr. Fiz. Zh.* **13**, N 5, 859–61 (1968) (Ukr.) (*P.A.* **68**: 40265).
TAKENO, S., "Energy spectrum of a disordered lattice," *J. Phys. Soc. Jap.* **26**, Suppl., 66–7 (1969) (Eng) (*P.A.* **70**: 1874).
TAKENO, S., " Exciton impurity states in an aperiodic polymer," *Chem. Phys. Letters* **2**, N 8, 579–80 (1968) (Eng).
TAHIR-KHELI, R. A. and TAGGART, G. B., " Theory of disordered four-component systems," *Progr. Theor. Phys.* **42**, N 6, 1265–83 (1969) (Eng).
ROSENSTOCK, H. B. and MCGILL, R. E., " Vibrations of disordered solids," *Phys. Rev.* **176**, N 3, 1004–14 (1968) (Eng).
VARMA, C. M., " Theory of defects in quantum crystals," *Phys. Rev. Letters* **23**, N 14, 778–81 (1969) (Eng).
WHALLEY, E. and LABBÉ, H. J., " Optical spectra of orientationally disordered crystals. III. Infrared spectra of the sound waves," J. *Chem. Phys.* **51**, N 7, 3120–7 (1969) (Eng).

7.6. Cooperative Effects and Excitons

AKIMOV, I. A. and SHABLJA, A. V., " About cooperative mechanism of luminescence spectral sensibilisation and of semiconductor photocurrent with dyes," *Zh. Prikl. Spektrosk.* **9**, N 4, 614–18 (1968) (Russ).
BALLARD, R. E., " The transfer of electronic excitation energy from rare earth ions to water vibrations," *Spectrochim. Acta* **24A**, N 1, 65–71 (1968) (Eng).
BELOUS V. M. and IL'MAS, E. R., " The effect of photon multiplication in AgCl," *Zh. Prikl. Spektrosk* **9**, N 4, 698–700 (1968) (Russ) (*P.A.* **69**: 26765).
MATTIS, P. C., " Theory of electronic switching effect as a cooperative phenomenon," *Phys. Rev. Letters* **22**, N 18, 936–9 (1969) (Eng) (*P.A.* **69**: 30933).
MERRIFIELD, R. E., AVAKIAN, P. and GROFF, P., " Fission of singlet excitons into pairs of triplet excitons in tetracene crystals," *Chem. Phys. Letters* **3**, N 3, 155–7 (1969) (Eng).
OZAWA, L. and NISHIKAWA, S., " Evidence of energy transfer from pair gadolinium ions to other rare earths in yttrium-gadolinium oxide crystal," *Jap. J. Appl. Phys.* **7**, N 11. 1354–60 (1968) (Eng).
PATTSER, K., " Summation of excitation energy in impurity crystals," *Optics and Spectrosc.* **27**, N 6, 954–9 (1969) (Russ).
POPE, M., GEACINTOV, N. E. and VOGEL, F., " Singlet exciton fission and triplet-triplet exciton fusion in crystalline tetracene," *Mol. Cryst. and Liq. Cryst.* **6**, N 1, 83–104 (1969) (Eng).
TULUB, A. V. and PATZER, K., " Theory of cooperative absorption (emission) of light in crystals," *Phys. Status Solidi* **26**, N 2, 693–700 (1968) (Ger.) (*P.A.* **68**: 31942).

7.7. Excitonic Mechanism of Energy Migration

TERSKOI, Y. A. and BRUDZ, V. G., " Electronic excitation energy transfer in solid solutions by virtual excitons," *Optics and Spectrosc.* **25**, N 6, 877–82 (1968) (Russ).
FRANKEVICH, E. L. and RUMYANTSEV, B. M., " Transfer of excitation energy in anthracene by a new type of exciton," *Pis'ma Zh. Eksp. Teor. Fiz.* **9**, N 7, 424–8 (1969) (Russ).
GAYEVSKY, A. S., ROSKOLODKO, V. G. and FAIDYSH, A. N., " Diffusion of triplet excitons and their interaction with impurity molecules in crystalline and vitreous benzophenone," *Proc. Int. Conf. Luminescence*, Budapest, 1966, 1 and 2, Budapest Akademiai Kiado, 486–8 (1968) (Eng) (*P.A.* **70**: 12603).
GAEVSKII, A. S. and FAIDYSH, A. N., " Effect of the intensity of exciting light on the interaction of triplet excitons with molecules of an impurity in benzophenone crystals," *Izv. Akad. Nauk SSSR, ser. Fiz.* **32**, N 8, 1294–8 (1968) (Russ).
GAEVSKII, A. S., PRIIMACHEK, V. R. and FAIDYSH, A. N., " Interaction of triplet excitons with excited molecules of naphthalene and deuteronaphthalene in benzephenone crystals," *Izv. Vyssh. Ucheb. Zaved., Fiz.*, N 8, 12–16 (1969) (Russ).
KOYANAGI, M., SHIGEOKA, T. and KANDA, Y., " Exciton migration in triplet states of pyrazine and deuterated pyrazines in the crystal," *Molec. Lumin., Int. Conf.*, 1968. New York, W. A. Benjamin 1969, 765–72 (1968) (Eng) (*C.A.* **69**: 26357n).
MOORE, C. B., " Laser studies of vibrational energy transfer," *Accounts Chemical Research* **2**, N 4, 103–9 (1969) (Eng) (*C.A.* **69**: 7929j).
NAGUIBAROVA, I. A. and NAGUIBAROV, V. R., " Exchanged-phonon mechanism of energy migration in solids," *Zh. Eksp. Teor. Fiz.* **55**, N 4, 1277–87 (1968) (Russ).
NYBERG, G., CHESNUT, D. B. and CRIST, B., " Exciton-controlled proton relaxation times in some ion radical salts of TCNQ," *J. Chem. Phys.* **50**, N 1, 341–3 (1969) (Eng).
PRIIMACHEK, V. P. and FAIDYSH, A. N., " Effect of exciting light intensity on the interaction of singlet and triplet excitons with impurity molecules in naphthalene crystals," *Optics and Spectrosc.* **27**, N 3, 431–8 (1969) (Russ) (*P.A.* **70**: 44898).

SHAIN, A. L., ACKERMAN, J. P. and TEAGUE, M. W., "Intramolecular triplet exciton transfer in some noncoplanar aromatic systems," *Chem. Phys. Letters* **3**, N 7, 550–1 (1969) (Eng) (*P.A.* **70**: 6958).
SUN YAO, H. Y. and YAO, S. J., "Second-order calculation of vibrational energy transfer," *J. Chem. Phys.* **51**, N 7, 2961–7 (1969) (Eng).
SWENBERG, C. E. and STACY, W. T., "Influence of resonance transfer and exciton diffusion on luminescence decay," *Phys. Status Solidi* **36**, N 2, 717–22 (1969) (Eng) (*P.A.* **70**: 18704).

7.8. Magnetic and Electrical Field Effects

AZUMI, T., ITO, M. and NAGAKURA, S., "Zeeman effect of phosphorescence. II. Intensity considerations on pyrazine phosphorescence," *Bull. Chem. Soc. Jap.* **42**, N 3, 685–9 (1969) (Eng).
AZUMI, T. and NAGAKURA, S., "Zeeman effect of phosphorescence. III. Theory of photoselection for Zeeman split phosphorescence," *Techn. Rept ISSP* **A**, N 309, 20 pp. (1969) (Eng).
DONNINI, J. M. and ABETINO, F., "Internal polarization in aromatic crystals. Study as a function of temperature and applied electric field," *C.R. Acad. Sci., Paris* **228B**, N 2, 185–8 (1969) (Fr).
FAULKNER, L. R. and BARD, A. J., "Magnetic field effects on anthracene triplet-triplet annihilation in fluid solutions," *J. Amer. Chem. Soc.* **91**, N 23, 6495–7 (1969) (Eng).
FAULKNER, L. R. and BARD, A. J., "Wurster's blue cation as an anthracene triplet quencher in fluid solution and the effect of magnetic field on this interaction," *J. Amer. Chem. Soc.* **91**, N 23, 6497–8 (1969) (Eng).
GEACINTOV, N., POPE, M. and VOGEL, F., "Effect of magnetic field on the fluorescence of tetracene crystals: exciton fission," *Phys. Rev. Letters* **22**, N 12, 593–6 (1969) (Eng) (*P.A.* **69**: 26779).
HASEGAWA, H. and NAKAMURA, M., "Impurity bands in a magnetic field," *J. Phys. Soc. Jap.* **26**, N 6, 1362–77 (1969) (Eng).
HOCHSTRASSER, R. M. and LIN, T. S., "Magnetic and electric field spectra of organic crystals: optical measurements of zero-field splittings," *J. Chem. Phys.* **49**, N 11, 4929–45 (1968) (Eng).
MALLEY, M., FEHER, J. and MAUZERALL, D., "The Stark effect in porphyrins," *J. Mol. Spectrosc.* **25**, N 4, 544–8 (1968) (Eng).
MALLEY, M., FEHER, G. and MAUZERALL, D., "The Zeeman effect in porphyrins," *J. Mol. Spectrosc.* **26**, N 3, 320–34 (1968) (Eng).
RUSIN, B. A. and FRANKEVICH, E. L., "Change of the concentration of Wannier excitons in molecular crystals caused by a magnetic field," *Phys. Status Solidi* **33**, N 2, 885–95 (1969) (Eng) (*P.A.* **69**: 39570).
SOOS, Z. G., "Zeeman population of optically produced triplet excitons in anthracene," *J. Chem. Phys.* **51**, N 5, 2107–12 (1969) (Eng) (*P.A.* **70**: 15130).

8. Photoconductivity of Molecular Crystals. Photoelectronic Emission

AVDEENKO, A. A., DOBROVOLSKAYA, T. L. and NABOIKIN, U. V., "Charge carrier photogeneration and luminescence in pyrene," *Fiz. Tverd. Tela* **10**, N 5, 1579–81 (1968) (Russ).
BAESSLER, H., RIEHL, N. and VAUBEL, G., "Photoemission of electrons from alkali and alkaline earth metals into anthracene crystals," *Mol. Cryst. and Liq. Cryst.* **9**, 249–64 (1969) (Eng).
BAESSLER, H. and VAUBEL, G., "Photoinjection of electrons into anthracene crystals," *Solid State Communs* **6**, N 9, 631–3 (1968) (Eng) (*P.A.* **69**: 5616).
BAESSLER, H., HERRMANN, G., RIEHL, N. and VAUBEL, G., "Space-charge-limited currents in tetracene single-crystals," *J. Phys. Chem. Solids* **30**, N 6, 1579–85 (1969) (Eng).
BATLEY, M. and LYONS, L. S., "Photoelectric emission from donor-acceptor solids and donor molecules," *Mol. Cryst.* **3**, N 3, 357–74 (1968) (Eng).
CHAIKEN, R. F. and KEARNS, D. R., "Intrinsic photoconduction in pyrene crystals," *J. Chem. Phys.* **49**, N 6, 2846–50 (1968) (Eng).
CHIORBOLI, P., PIETRA, S. and PASSALACQUA, V., "On the photoconductivity of dibenzthiophene," *Ricerca Sci.* **38**, N 9, 796–800 (1968) (Italy) (*P.A.* **69**: 49165).
CHOJNACKI, H. and GOLEBIEWSKI, A., "Band structure and current carriers mobilities in imidazole crystal," *Mol. Cryst. and Liq. Cryst.* **5**, N 4, 317–30 (1969) (Eng).
DAMASK, A. C. and DIENES, G. J., "Electronic transport properties of a simple molecular crystal." *Comments Solid State Phys.* **11**, N 2, 64–7 (1969) (Eng).
DONNINI, J. M. and ABETINO, F., "Photoemission of metal electrons in anthracene crystals," *C.R. Acad. Sci., Paris*, **269**, **A** and **B**, N 1, 34–7 (1969) (Fr).
DRESNER, J., "Double injection electroluminescence in anthracene," RCA Rev. **30**, N 2, 322–34 (1969) (Eng) (*P.A.* **69**: 49336).
FLEET, B., KELIHER, P. N., KIRKBRIGHT, G. F. and PICKFORD, C. J., "Electrochemiluminescence of solution mixtures; 1. Anthanthrene, 9-10-diphenylanthracene, rubicene, rubrene," *Spectrosc. Letters* **2**, N 5, 133–9 (1969) (Eng).
FREJMANIS, Y. F. and BERZIN, L. E., "About new type of organic semiconductors," *Dokl. Akad. Nauk SSSR* **185**, N 1, 139–41 (1969) (Russ).
GREEN, M. E., "Charge-carrier injection and the pre-exponential factor in semiconducting organic substances," *J. Chem. Phys.* **51**, N 8, 3279–80 (1969) (Eng).
IKEDA, M., MORIMOTO, K., MURAKAMI, Y. and SATO, H., "Dye sensitization of photoconductivity of poly-N-vinylcarbazole. I. Quantum yield," *Jap. J. Appl. Phys.* **8**, N 6, 759–65 (1969) (Eng) (*P.A.* **69**: 49167).
JOHNSTON, G. R., "Current-voltage responses for dark conduction through anthracene crystals," *Chem. Phys. Letters* **3**, N 9, 699–701 (1969) (Eng).
JOHNSTON, G. R. and LYONS, L. E., "The effect of surface purity on the photogeneration of charge carriers in anthracene single crystals," *Chem. Phys. Letters* **2**, N 7, 489–92 (1968) (Eng).
KLEINHEINS, G., "Drift mobility in injected charge-carriers in liquid benzene," *Phys. Letters* **28A**, N 7, 498–9 (1969) (Eng).
KOCHI MASAKATSU., "Photoemission from organic crystals," *Kagaku No Ryoiki* **23**, N 1, 30–4 (1969) (Japan) (*C.A.* **69**: 26107f).
KOLNINOV, O. V., VOZZHENNIKOV, V. M., ZVONKOVA, Z. V., GLUSHKOVA, V. P. and SHAPIRO, E. E., "Photo EMF and electrical conductivity of complexes of aromatic hydrocarbons with tetracyano quinodimethane," *Dokl. Akad. Nauk SSSR* **189**, N 2, 353–6 (1969) (Russ).

KORN, A. I. ARNDT, R. A. and DAMASK, A. C., "Hall mobility of holes in anthracene," *Phys. Rev.* **186**, N 3, 938–41 (1969) (Eng).
KUMAR, N. and SINHA, K. P., "Possibility of photoinduced superconductivity," *Phys. Rev.* **174**, N 2, 482–8 (1968) (Eng).
KUNSTREICH, S. and OTTO, A., "Anisotropy of electron energy loss spectra in anthracene single crystals," *Optics Communs* **1**, N 2, 45–6 (1969) (Eng).
LADIK, J., BICZÓ, G. and RÉDLY, J., "Possibility of superconductive-type enhanced conductivity in DNA at room temperature," *Phys. Rev.* **188**, N 2, 710–15 (1969) (Eng).
LOGOTHETIS, E. M. and HARTMAN, P. L., "Laser-induced electron emission from solids: many-photon photoelectric effects and thermoionic emission," *Phys. Rev.* **187**, N 2, 460–74 (1969) (Eng).
MALBIN, M. D. and MARK, H. B., JR, "The electrochemiluminescence of the diphenylanthracene radical anion," *J. Phys. Chem.* **73**, N 8, 2786–7 (1969) (Eng).
MICHEL-BEYERLE, M. E., REBENTROST, F. and WILLIG, F., "Injection of defect electrons into perylene single crystals by electrolytic contacts," *Solid State Communs* **7**, N 6, 493–6 (1969) (Eng).
MORRIS, R. and SILVER, M., "Direct electron-hole recombination in anthracene," *J. Chem. Phys.* **50**, N 7, 2969–73 (1969) (Eng).
MUNN, R. W. and SIEBRAND, W., "Phonon-limited transport of charge-carriers in molecular crystals," *Chem. Phys. Letters* **3**, N 9, 655–7 (1969) (Eng).
OYAMA, K. and NAKADA, I., "Photoconduction of 9,10-anthraquinone single crystals," *J. Phys. Soc. Jap.* **24**, N 4, 798–805 (1968) (Eng).
PARKER, C. A. and SHORT, G. D., "Comment on the electrochemiluminescence from phenanthrene solutions," *J. Phys. Chem.* **72**, N 8, 3071 (1968) (Eng).
POPE, M., "Photoelectric effects in thin organic crystals," in 133rd meeting of the Electrochemical Society, Abstracts, Boston, Ma., USA, 5–9 May 1968. New York, USA: Electrochem. Soc., 1968, 8 (Eng) (*P.A.* **70**: 23777).
POTT, G. T. and WILLIAMS, D. F., "Electron photoemission from anthracene crystals," *J. Chem. Phys.* **51**, N 1, 203–210 (1969) (Eng) (*C.A.* **70**: 54976g).
POTT, G. T. and WILLIAMS, D. F., "Low-temperature electron injection and space-charge-limited transients in anthracene crystals," *J. Chem. Phys.* **51**, N 5, 1901–6 (1969) (Eng) (*P.A.* **70**: 15104).
PROCK, A. and ZAHRADNIK, R., "Photoconduction of pyranthrene in benzene," *J. Chem. Phys.* **49**, N 7, 3204–10 (1968) (Eng).
REUCROFT, P. J., KRONICK, P. L. and HALLMAN, E. E., "Photovoltaic effects in tetracene crystals," *Mol. Cryst. and Liq. Cryst.* **6**, N 2, 247–54 (1969) (Eng).
ROSENBERG, B., BHOWMIK, B. B., HARDER, H. C. and POSTOW, E., "Pre-expotential factor in semiconducting organic substances," *J. Chem. Phys.* **49**, N 9, 4108–14 (1968) (Eng).
RUSIN, B. A., RUMYANTSEV, B. M., ALEXANDROV, I. V. and FRANKEVICH, E. L., "Anisotropy of magnetic field quenching photoconductivity and delayed fluorescence of anthracene," *Phys. Status Solidi* **34**, N 2, K103–5 (1969) (Eng) (*P.A.* **70**: 8661).
SCHADT, M. and WILLIAMS, D. F., "Low-temperature hole injection and hole trap distribution in anthracene," *J. Chem. Phys.* **50**, N 10, 4364–8 (1969) (Eng).
SCHMIDT, K. and WEDEL, K., "Negative photo-effect by double injection into anthracene single crystals," *Phys. Status Solidi* **34**, N 2, K167–8 (1969) (Eng).
SCHMIDT, K. and WEDEL, K., "Negative resistance by double injection into anthracene crystals," *Phys. Status Solidi* **35**, N 1, K89–91 (1969) (Eng).
SCHOTT, M., "Remarks on the process of carrier generation in electron-bombarded crystalline anthracene," *Mol. Cryst. and Liq. Cryst.* **5**, N 3, 229–43 (1969) (Eng).
SHCHEGOLEV, I. F., BURAVOV, L. I., ZVARYKINA, A. V. and LYUBOVSKII, R. B., "Mechanism of conductivity in good conducting organic complexes based on tetracyanoquinodimethane," *Pis'ma Zh. Eksp. Teor. Fiz.* **8**, N 7, 353–6 (1968) (Russ).
SILINSH, E. A. and TAURE, L. F., "On the mechanism of charge-carrier generation in thin layers of molecular associates," *Phys. Status Solidi* **32**, N 2, 847–52 (1969) (Eng) (*C.A.* **69**: 33366).
SLOBODYANIK, V. V. and FAIDYSH, A. N., "Luminescence of anthracene-alkali metal complexes, and their effect on the photoconductivity of anthracene crystals," *Optics and Spectrosc.* **26**, N 2, 257–263 (1969) (Russ).
SWORAKOWSKI, J. and MAGER, J., "Space-charge-limited currents in single crystals of anthracene doped with perylene," *Acta Phys. Polon.* **36**, N 3, 483–6 (1969) (Eng).
SWORAKOWSKI, J., "Temperature dependence of saturation currents in the system: anthracene-liquid redox electrode," *Acta Phys. Polon.* **35**, N 1, 33–8 (1969) (Eng).
SZYMANSKI, A. and LABES, M. M., "Charge carrier mobility in tetracene," *J. Chem. Phys.* **50**, N 4, 1898–9 (1969) (Eng) (*P.A.* **69**: 30817).
SZYMANSKI, A., LARSON, D. C. and LABES, M. M., "A temperature-dependent conducting state in tetracene thin film," *Appl. Phys. Letters* **14**, N 3, 88–90 (1969) (Eng).
VAUBEL, G. and KALLMANN, H., "Diffusion length and lifetime of triplet excitons and crystal absorption coefficient in tetracene determined from photocurrent measurements," *Phys. Status Solidi* **35**, N 2, 789–92 (1969) (Eng) (*P.A.* **70**: 12242).
VIDADI, U. A., ROZENSHTEIN, L. D. and CHISTYAKOV, E. A., "Jump and band conductivity in organic semiconductors," *Fiz. Tverd. Tela* **11**, N 1, 219–22 (1969) (Russ).
YAKOVLEV, B. S. and FRANKEVICH, E. L., "Photogeneration of holes in crystalline tetracene," *Fiz. Tverd. Tela* **11**, N 7, 1975–7 (1969) (Russ).
ZITTARTZ, J., "Transport properties of the 'excitonic insulator': electrical conductivity," *Phys. Rev.* **165**, N 2, 605–11 (1968) (Eng) (*P.A.* **68**: 13652).

9. Effects of High Exciton Concentration in Non-Metallic Crystals

9.1. Phase Transitions in Excitonic Insulator

AGRANOVICH, V. M. and TOSHICH, B. S., "Collective properties of Frenkel excitons," *Zh. Eksp. Teor. Fiz.* **53**, N 1, 149–61 (1967) (Russ) (*P.A.* **68**: 5122).
ANTONOV, V. N., KOPAEV, U. V., PASHINTSEV, U. I. and RAKOV, A. V., "Mott transition for excitons in silicon," *Fiz. Tverd. Tela* **11**, N 5, 1422–4 (1969) (Russ).

ASNIN, V. M. and ROGACHEV, A. A., " Condensation of exciton gas in germanium," *Pis'ma Zh. Eksp. Teor. Fiz.* **9**, N 7, 415–19 (1969) (Russ).
ASNIN, V. M. and ROGACHEV, A. A., " Mott transition in the exciton system in germanium." *Pis'ma Zh. Eksp. Teor. Fiz.* **7**, N 12, 464–7 (1968) (Russ) (*P.A.* **69**: 3659).
BAGAEV, V. S., GALKINA, T. I., GOGOLIN, O. V. and KELDYSH, L. V., " Motion of electron hole pairs in germanium," *Pis'ma Zh. Eksp. Teor. Fiz.* **10**, N 7, 309–13 (1969) (Russ).
FRÖHLICH, H., " Bose condensation of strongly excited longitudinal electric modes," *Phys. Letters* **26A**, N 9, 402–3 (1968) (Eng).
GERGEL', V. A., " Optical properties of semiconductors with a high concentration of excitons," *Fiz. Tverd. Tela* **11**, N 12, 3538–43 (1969) (Russ) (*P.A.* **70**: 31624).
GERGEL', V. A., KAZARINOV, R. F. and SURIS, R. A., " Superfluidity of excitons in semiconductors," *Zh. Eksp. Teor. Fiz.* **54**, N 1, 298–302 (1968) (Russ) (*P.A.* **68**: 22476).
GROSS, E. F., IL'INSKII, A. V., NOVIKOV, B. V. and SOKOLOV, N. S., " Optical phenomena related to the condensation of excitons in a germanium crystal," *Fiz. Tverd. Tela* **11**, N 10, 3007–9 (1969) (Russ).
KELDYSH, L. V. and KOZLOV, A. N., " Collective properties of excitons in semiconductors," *Zh. Eksp. Teor. Fiz.* **54**, N 3, 978–93 (1968) (Russ) (*P.A.* **68**: 40263).
KOPAEV, YU. V. and RUSINOV, A. I., " Theory of impurity states in an exciton insulator," *Fiz. Tverd. Tela* **11**, N 5, 1306–13 (1969) (Russ) (*P.A.* **70**: 4606).
LELYAKOV, A. V. and MOSKALENKO, S. A., " Absorption and luminescence bands in the case of Bose-Einstein condensation of excitons interacting with phonons," *Fiz. Tverd. Tela* **11**, 3260–5 (1969) (Russ) (*P.A.* **70**: 28606).
MAJERNIKOUÁ, E., " On the influence of exciton-exciton interaction on the critical temperature of Bose-Einstein condensation," *Czechosl. J. Phys. B* **19**, N 7, 821–6 (1969) (Eng).
MIGLEI, M. F., MOSKALENKO, S. A. and LELYAKOV, A. V., " The change of sound velocity at the Bose-Einstein condensation of excitons in crystals," *Phys. Status Solidi* **35**, N 1, 389–95 (1969) (Eng).
POKROVSKII, Y. E. and SVISTUNOVA, K. I., " Emergence of a condensed of non-equilibrium charge carriers in germanium," *Pis'ma Zh. Eksper. Teor. Fiz.* **9**, N 7, 435–8 (1969) (Russ).
TONG, B. Y. and CHOW, W. S., " On the transition temperature of an excitonic insulator," *J. Phys., C, Proc. Phys. Soc.* **2**, N 4, 583–5 (1969) (Eng).
TRLIFAJ, M., " Superliquid state of an exciton mixture with small exciton radii in molecular crystals," *Czechosl. J. Phys.* **19B**, N 10, 1191–8 (1969) (P.A. **70**: 15125).
TRLIFAJ, M., "Superliquid state of small-ra lius excitons in molecular crystals," *Czechosl. J. Phys.* **18B**, N 12, 1576–86 (1968) (Eng).
VAVILOV, V. S., ZAYATS, V. A. and MURZIN, V. N., " Resonance absorption, scattering, and radiation of electron hole pairs in germanium in the region of their plasma frequency," *Pis'ma Zh. Eksp. Teor. Fiz.* **10**, N 7, 304–9 (1969) (Russ).
WALKER, M. B., " Nonexistence of excitonic insulators in one and two dimensions," *Canad. J. Phys.* **46**, N 7, 817–21 (1968) (Eng).
ZITTARTZ, J., " Transport properties of the 'Excitonic Insulator': electrical conductivity," *Phys. Rev.* **165**, N 2, 605–11 (1968) (Eng) (*P.A.* **68**: 13652).
ZITTARTZ, J., " Transport properties of the 'Excitonic Insulator': thermal conductivity," *Phys. Rev.* **165**, N 2, 612–17 (1968) (Eng) (*P.A.* **68**: 13653).

9.2. Molecular Compounds of Excitons

KNOX, R. S., NIKITINE, S. and MYSYROWICZ, A., " Kinetics of biexciton formation in CuCl," *Optics Communs* **1**, N 1, 19–21 (1969) (Eng) (*P.A.* **69**: 35318).
KOPAEV, YU. V. and RUSINOV, A. I., " Theory of impurity states in an exciton insulator," *Fiz. Tverd. Tela* **11**, N 5, 1306–13 (1969) (Russ) (*P.A.* **70**: 4606).
MAJERNIKOVA, E., " The interaction of two excitons in a benzene crystal," *Czechosl. J. Phys.* **18B**, N 7, 830–9 (1968) (Eng) (*P.A.* **68**: 49114).
MOSKALENKO, S. A. and KHADZHI, P. I., " Inelastic collision of an exciton with a biexciton," *Fiz. Tekh. Poluprov.* **3**, N 4, 511–17 (1969) (Russ) (*P.A.* **69**: 47054).
MYSYROWICZ, A., GRUN, J. B., LEVY, R., BIVAS, A. and NIKITINE, S., " Excitonic molecule in CuCl," *Phys. Letters* **26A**, N 12, 615–16 (1968) (Eng) (*P.A.***68**: 31300).
PATZER, K., " Theory of biexcitons in single crystals," *Phys. Status Solidi* **32**, N 1, 11–22 (1969) (Ger.) (*P.A.* **69**: 26486).
SHARMA, R. R., " Binding energy of the excitonic molecule," *Phys. Rev.* **170**, N 3, 770–2 (1968) (Eng) (*P.A.* **68**: 40262).
SHARMA, R. R., " Binding energy of the positronium molecule," *Phys. Rev.* **171**, N 1, 36–42 (1968) (Eng).
WEHNER, R. K., " On the excitonic molecule," *Solid State Communs* **7**, N 5, 457–8 (1969) (Eng) (*P.A.* **69**: 18590).

10. Excitons and Magnons in Antiferromagnetic Crystals

ALBERTI, F., ASHBY, R. A. and DOUGLAS, A. E., " Absorption spectra of O_2 in the $a'\Delta g$, $C'\Sigma^+ g$, and $X^3\Sigma^- g$ states," *Canad. J. Phys.* **46**, N 5, 337–42 (1968) (Eng) (*C.A.* **68**: 100269s).
ALLEN, J. W., MACFARLANE, R. M. and WHITE, R. L., " Magnetic Davydov splitting in the optical absorption spectrum of Cr_2O_3," *Phys. Rev.* **179**, N 2, 523–41 (1969) (Eng) (*P.A.* **69**: 33552).
AOYAGI, K., TSUSHIMA, K. and UESUGI, M., " Absorption spectrum of an antiferromagnetic rare-earth garnet $Dy_3Al_3O_{12}$ above and below the Néel temperature," *J. Phys. Soc. Jap.* **27**, N 1, 49–56 (1969) (Eng).
AOYAGI, K., TSUSHIMA, K. and SUGANO, S., "Direct observation of Davydov splitting in antiferromagnetic $YCrO_3$," *Solid State Communs*, **7**, N 1, 229–32 (1969) (Eng).
CHAMBERLAIN, J. R. and GOURLEY, J. T., " Magnon effects in sharp spectra," *Phys. Letters* **26A**, N 9, 430–1 (1968) (Eng) (*C.A.* **68**: 118094r).
DIETZ, R. E., MEIXNER, A. E., GUGGENHEIM, H. J. and MISETICH, A., " Observation of a thermodynamic distinction between Brillouin zone center and boundary exciton states in MnF_2," *Phys. Rev. Letters* **21**, N 15, 1067–70 (1968) (Eng) (*P.A.* **69**: 1434).

DUDKO, K. L., EREMENKO, V. V. and SEMENENKO, L. M., " The effect of uniaxial compression on the critical field of the ' spin flip ' transition in Cr_2O_3," *Phys Letters* **30A**, N 8, 459–60 (1969) (Eng).
ELLIOT, R. J., THORPE, M. F., IMBUSCH, G. F., LOUDON, R. and PARKINSON, J. B., " Magnon-magnon and exciton-magnon interaction effects on antiferromagnetic spectra," *Phys. Rev. Letters* **21**, N 3, 147–50 (1968) (Eng) (*C.A.* **69**: 56048p).
ELLIOT, R. J. and THORPE, M. F., " The effects of magnon-magnon interaction on the two-magnon spectra of antiferromagnets," *J. Phys., C, Proc. Phys. Soc.* **2**, N 9, 1630–43 (1969) (Eng).
EREMENKO, V. V. and BELYAEVA, A. I., " Light absorption in antiferromagnetic dielectrics," *Usp. Fiz. Nauk* **98**, N 1, 27–70 (1969) (Russ).
FERGUSON, J., " Electronic absorption spectra of $KMnF_3$, $RbMnF_3$, and MnF_2," *Aust. J. Chem.* **21**, N 2, 307–21 (1968) (Eng).
FLEURY, P. A., WORLOCK, J. M. and GUGGENHEIM, H. J., " Light scattering from phonons and magnons in $RbNiF_3$," *Phys. Rev.* **185**, N 2, 738–42 (1969) (Eng) (*P.A.* **70**: 21485).
FREEMAN, S. and HOPFIELD, J. J., " Exciton-magnon interaction in magnetic insulators," *Phys. Rev. Letters* **21**, N 13, 910–13 (1968) (Eng) (*P.A.* **69**: 1706).
HERBERT, D. C., " Magnon interactions in hematite (a-Fe_2O_3)," *Phys. Rev. Letters* **22**, N 22, 1184–5 (1969) (Eng).
HUFFMAN, D. R., WILD, R. L. and SHINMEI, M., " Optical absorption spectra of crystal-field transitions in MnO," *J. Chem. Phys.* **50**, N 9, 4092–4 (1969) (Eng).
KHOLA, R. K. and CHAUNDHURI, M., " Photon-magnon conversion efficiency in axially magnetized garnet delay line," *J. Phys. Soc. Jap.* **27**, N 4, 824–5 (1969) (Eng).
KRISHNA, V. G., " Simultaneous and induced electronic transitions in oxygen. I," *J. Chem. Phys.* **50**, N 2, 792–9 (1969) (Eng).
KRITAYAKIRANA, K., BERGER, P. and JONES, R. V., " Optical spectra of ferroelectric-antiferromagnetic rare earth manganates," *Optics Communs* **1**, N 3, 95–8 (1969) (Eng).
LE GALL, H., JAMET, J. P. and CAGAN, V., " Scattering of infrared radiation by two-magnon processes in yttrium-iron garnet," *Solid State Communs* **7**, N 1, 27–31 (1969) (Eng) (*P.A.* **69**: 24421).
LE-PAILLIER-MAL, A. and DELSART, C., " Optical absorption spectrum of a manganese oxide crystal in the antiferromagnetic state," *C.R. Acad. Sci., Paris* **268B**, N 15, 1032–5 (1969) (Fr).
LITVINENKO, U. G., EREMENKO, V. V. and GARBER, T. I., " Features of light absorption by crystalline alpha oxygen in the 7900–11500 cm^{-1} range," *Ukr. Fiz. Zh.* **14**, N 2, 327–9 (1969) (Ukr.).
LITVINENKO U. G., EREMENKO, V. V. and GARBER, T. I., " Participation of magnons in the absorption of light by antiferromagnetic alpha oxygen," *Pis'ma Zh. Eksp. Teor. Fiz.* **7**, N 10, 378–82 (1968) (Russ).
LOUDON, R., " Theory of infra-red and optical spectra of antiferromagnets," *Adv. Phys.* **17**, N 66, 243–80 (1968).
MAITRA, A. T., " Effect of lattice vibrations on the exchange-interaction in ferro- and antiferromagnetic crystals," *Indian J. Phys.* **43**, N 5, 289–93 (1969) (Eng) (*P.A.* **70**: 25948).
MCCLURE, D. S., " Excitons and magnons in antiferromagnetic crystals," In *Excitons, magnons and phonons in molecular crystals, Beirut, Lebanon, 15–18 Jan 1968*, London, England, Cambridge, 135–52 (1968) (Eng) (*P.A.* **70**: 12043).
MELTZER, R. S., CHEN, M. Y., MCCLURE, D. S. and LOWE-PARISEAU, M., " Exciton-magnon bound state in MnF_2 and the exciton dispersion in MnF_2 and $RbMnF_3$," *Phys. Rev. Letters* **21**, N 13, 913–16 (1968) (Eng) (*P.A.* **69**: 1707).
MELTZER, R. S. and LOHR, L. Z. JR., " Magnetic dipole optical absorption spectrum of MnF_2," *J. Chem. Phys.* **49**, N 2, 541–56 (1968) (Eng) (*P.A.* **69**: 82009w).
MELTZER, R. S., " Optical absorption spectrum of antiferromagnetic manganese difluoride," U.S. Clearinghouse Fed. Sci. Tech. Inform., AD 1968, AD-673989, 203 pp. From *U.S. Govt. Res. Develop. Rep.* **68**, N 21, 176, (1968) (Eng) (*C.A* **69**: 72513m).
MELTZER, R. S. LOWE, M. and MCLURE, D. S., " Magnon sidebands in the optical absorption spectrum of MnF_2," *Phys. Rev.* **180**, N 2, 561–78 (1969) (Eng) (*P.A.* **69**: 35661).
MISETICH, A. and DIETZ, R. E., " Role of exciton dispersion and exciton-magnon interactions on the shape of magnon sidebands in stressed MnF_2," *J. Appl. Phys.* **39**, N 2, 1145 (1968) (Eng) (*P.A.* **68**: 36389).
MISETICH, A., DIETZ, R. E. and GUGGENHEIM, H. J., " Spin wave side bands of localized excitons," *Localized Excitations Solids, Proc. Int. Conf., 1st, 1967*, New York, Plenum Press, 379–85 (1968) (Eng) (*C.A.* **69**: 15689a).
MOCH, P. and PARISOT, G., " Observation of localized magnons by Raman scattering in Ni-doped MnF_2," *Phys. Rev. Letters* **21**, N 23, 1596–9 (1968) (Eng) (*P.A.* **69**: 14062).
NIKOTIN, O., LINDGARD, P. A. and DIETRICH, O. W., " Magnon dispersion relation and exchange interactions in MnF_2," *J. Phys., C, Proc. Phys. Soc.* **2**, N 7, 1168–73 (1969) (Eng).
PETROV, E. G., LOKTEV, V. M. and GAIDIDAY, YU. B., " Exciton excitations of the antiferromagnetic dielectric and the electric moment of the double optical transitions," *Phys. Letters* **30A**, N 7, 432–3 (1969) (Eng) (*C.A.* **70**: 15127).
PRIKHOT'KO, A. F. and PAKHOMOVA, O. S., " Absorption of solid oxygen at 4-deg.-K. In the range 15000-33000 cm^{-1}," *Ukr. Fiz. Zh.* **13**, N 1, 19–27 (1968) (Ukr.).
SELL, D. D., " Review of magnon-sideband experiments," *J. Appl. Phys.* **39**, N 2, 1030–5 (1968) (Eng) (*P.A.* **68**: 36298).
SRIVASTAWA, J. P., MEHRA, A. and VENKATESWARLU, P., " Electronic absorption spectrum of $NaMnF_3$," *Proc. Nucl. Phys. and Solid State Phys. Sympos., Madras, 1968. Solid State Phys.*, S.1., s.a., 329–31 (1968) (Eng).
SHAPIRO, M. M. and STEVENSON, R., " Multiple magnons in the absorption spectra of thin slabs of MnF_2 and $KMnF_3$," *J. Appl. Phys.* **40**, N 3, 989–90 (1969) (Eng) (*P.A.* **69**: 45326).
SINHA, S. K., LIU, S. H., MUHLESTEIN, L. D. and WAKABAYASHI, N., " Neutron-scattering study of magnons and paramagnons in a chromium-manganese alloy," *Phys. Rev. Letters* **23** N 6, 311–4 (1969) (Eng).
STEPHAN, G., LE CALVEZ, Y., LEMONIER, J. C. and ROBIN, S., " Optical properties and electronic spectrum of MgF_2 and CaF_2 from 10 to 48 eV," *J. Phys. Chem. Solids* **30**, N 3, 601–8 (1969) (Fr) (*P.A.* **70**: 2311).
SUGANO, S., AOYAGI, K. and TSUSHIMA, K., " Mechanism for spin-forbidden resonance energy transfer in antiferromagnets," *Solid State Communs* **7**, N 1, 233–5 (1969) (Eng).
THORPE, M. F., " Magnon-magnon interactions in doped antiferromagnets," *Phys. Rev. Letters* **23**, N 9, 472–4 (1969) (Eng).

THORPE, M. F. and ELLIOT, R. J., " Two-magnon pairing effects on the optical spectra of antiferromagnets," *Solid State Communs* **6**, N 10, vii (1968) (Eng) (*P.A.* **69**: 12435).
TONEGAWA, T., " Theory of magnon sidebands in MnF_2," *Progr. Theor. Phys.* **41**, N 1, 1–24 (1969) (Eng) (C.A. **69**: 72481a).
TORRANCE, J. B., JR. and TINKHAM, M., " Excitation of multiple-magnon bound states in $CoCl_2.2H_2O$," *Phys. Rev.* **187**, N 2, 595–606 (1969) (Eng).
TORRANCE, J. B., JR, and TINKHAM, M., " Magnon bound states in anisotropic linear chains," *Phys. Rev.* **187**, N 2, 587–94 (1969) (Eng).
TYLICKI, J., YEN, W. M., VAN DER ZIEL, J. P. and GUGGENHEIM, H. J., " Magnetic effects on the optical absorption spectrum of $RbNiF_3$," *Phys. Rev.* **187**, N 2, 758–65 (1969) (Eng).
WACHTEL, E. J. and WHEELER, R. G., " Magnon spectrum of alpha oxygen," *Phys. Rev. Letters* **24**, 233–6 (1969) (Eng) (*P.A.* **70**: 28626).
WEBER, R., " Spin wave impurity states in linear chain ferromagnets and antiferromagnets," *Z. Phys.* **223**, N 4, 299–337 (1969) (Eng) (*P.A.* **69**: 39761).
WILLIAMS, G. and LORAM, J. W., " Electron-magnon scattering in dilute PdMn at low temperatures," *Solid State Communs* **7**, N 17, 1261–5 (1969) (Eng) (*P.A.* **70**: 8304).
VAN DER ZIEL, J. P. and VAN UITERT, L. G., " Magnon-assisted optical emission in $YCrO_3$ and $LuCrO_3$," *Phys. Rev.* **179**, N 2, 343–51 (1969) (Eng) (*P.A.* **69**: 31136).
VAN DER ZIEL, J. P. and VAN UITERT, L. G., " Magnon-assisted chromium emission in $YCrO_3$, and $GdCrO_3$," *J. Appl. Phys.* **40**, N 3, 997–8 (1969) (Eng) (*P.A.* **69**: 49321).
VAN DER ZIEL, J. P. and GUGGENHEIM, H. J., " Optical spectrum of CoF_2," *Phys. Rev.* **166**, N 2, 479–487 (1968) (Eng).

11. Excitons in Metals, Liquids and Miscellaneous Organic Systems

BALDINI, G., " Experimental studies of excitons in the SRG and AH," In *Lectures on elementary excitations and their interactions in solids*, Cortina d'Ampeyyo, 11–23 Jul 1966. Cortina d'Ampezzo, Nato Advanced Study Institute, 1968, 12 pp. (Eng).
BENSING, J. L. and PYSH, E. S., " Higher energy excitons in polypeptide films," *Chem. Phys. Letters* **4**, N 3, 120–2 (1969) (Eng) (*P.A.* **70**: 8343).
CHEN, I., " Band structures of metal-free phtalocyanine in the β phase," *J. Chem. Phys.* **51**, N 8, 3241–3248 (1969) (Eng).
FISCHER, S. and RICE, S. A., " Study of exciton dynamics in a simple liquid," *Phys. Rev.* **176**, N 1, 409–19 (1968) (Eng).
KLOEPFFER, W., " Fluorescence studies of excitons of poly (vinyl carbazole)," *Ber. Bunsenges. Phys. Chem.* **73**, 864–7 (1969) (Ger).
MIYATA, M. and YOMOSA, S., " Exciton states in synthetic polynucleotides," *J. Phys. Soc. Jap.* **27**, N 3, 727–35 (1969) (Eng).
MIYATA, T. and YOMOSA, S., " Exciton band structures in homopolynucleotides," *J. Phys. Soc. Jap.* **26**, N 1, 154–62 (1969) (Eng) (*P.A.* **69**: 26488).
PARTRIDGE, R. H., " Exciton interpretation of the vacuum-ultraviolet absorption spectra of saturated organic polymers," *J. Chem. Phys.* **49**, N 8, 3656–68 (1968) (Eng) (*P.A.* **69**: 10216).
RAZ, B. and JORTNER, J., " Trapped exciton states in liquid argon," *J. Chem. Phys.* **49**, N 7, 3318–20, (1968) (Eng).
RICE, S. A., NICOLIS, G. and JORTNER, J , " Theory of excitons in liquids. IV. A simplified treatment of the shift and damping of polarization waves," *J. Chem. Phys.* **48**, N 6, 2484–94 (1968) (Eng).
SOMMER, B. S. and JORTNER, J , "Triplet-exciton dynamics in polyadenilic acid," *J. Chem. Phys.* **49**, N 9, 3919–28 (1968) (Eng) (*P.A.* **69**:9300).
YOMOSA, S , MIYATA, T. and SUZUKI, H , " Energy band structures in polypeptides," *J. Phys. Soc. Jap.* **24**, N 4, 878–84 (1968) (Eng).
YOMOSA, S., HONDA, M. and SUZUKI, H., " Exciton band structures in polypeptides," *J. Phys. Soc. Jap.* **26**, N 6, 1485–94 (1969) (Eng).

12. Molecular Crystal Structure

AMMON, H. L., SUNDARALINGAN, M. and STEWART, J. M., " The crystal and molecular structure of 2,2'di (1,4-naphthoquinone)," *Acta Cryst.* **25B**, N 2, 336–43 (1969) (Eng).
BART, J. C. J., " The crystal structure of a modification of hexaphenylbenzene," *Acta Cryst.* **24B**, N 10, 1277–87 (1968) (Eng).
BAUMGARTH, F., NGUYEN-BA-CHANH, GAY, R., LASCOMBE, J. and LE-CALVE, N., " High temperature crystalline phase of β-naphthol and β-naphthol-naphthalene solid solutions," *J. Chim. Phys., (France)* **66**, N 5, 862–8 (1969) (Fr).
BEEVERS, C. A., " Miniature molecular and crystal structure models," *Acta Cryst.* **25A**, pt. 3, Suppl., p. S63 (1969) (Eng) (*P.A.* **70**: 21829).
CHARBONNEAU, G. and MEINNEL, J., " Disordered structure of 1-chloro-2,3,5,6-tetramethyl benzene at 20 °C and − 170 °C," *J. Chim. Phys. (France)* **65**, N 9, 1590–4 (1968) (Fr) (*P.A.* **69**: 17273).
CHIANG, K., FORSYTH, P., MORRISON, L., COHEN, J. B. and KAUFFMAN, J. W., " An X-ray study of a possible phase transition in phenanthrene," *Phys. Letters* **30A**, N 9, 531–2 (1969) (Eng).
DATT, S. C. and VERMA, J. K. D., " Temperature gradient for the growth of large single crystals of naphthalene," *Ind. J. Pure Appl. Phys.* **6**, N 2, 96–7 (1968) (Eng).
DEFRAIN, A., DUPONT, M., JAMET, M. and LINH, N.-T., " Metastable crystalline phase of toluene," *C.R. Acad. Sci., Paris* **267C**, N 25, 1642–4 (1968) (Fr).
DELLACA, R. J., PENFOLD, B. R. and ROBINSON, W. T., " The crystal structure of 1,8-dichloro-9-methylanthracene," *Acta Cryst.* **25B**, N 8, 1589–4 (1969) (Eng).
HULME, R. and SZYMANSKI, J. T., " The crystal structure of the 2:1 complex between antimony trichloride and naphthalene," *Acta Cryst.* **25B**, N 4, 753–61 (1969) (Eng).
JOVANOVIC, B., " Lattice parameters and space groups of two stilbene substituents," *Acta Cryst.* **25B**, N 1, 2411 (1969) (Eng).

KIRK, R. S., " Crystal structure and molecular orientation in phthalocyanine thin films," *Mol. Cryst. and Liq. Cryst.* **5**, N 2, 211–15 (1968) (Eng).
KLIMASENKO, N. L. and GOL'DER, G. A., " Crystal and molecular structure of α-chloroanthraquinone," *Kristallografiya* **14**, N 4, 694–5 (1969) (Russ).
LOBANOVA, G. M., " Molecular and crystal structure of benzophenone," *Kristallografiya* **13**, N 6, 984-6 (1968) (Russ).
MASLEN, E. N., " A procedure for the refinement of accurate diffraction data from molecular crystals," *Acta Cryst.* **25A**, pt. S3, Suppl., p. S126 (1969) (Eng).
MICHELL, D., ROBINSON, P. M. and SMITH, A. P., " Direct observation of dislocations in anthracene," *Phys. Status Solidi* **26**, N 2, K93–5 (1968) (Eng).
MILLS, R. L. and SCHUCH, A. F., " Crystal structure of gamma nitrogen," *Phys. Rev. Letters* **23**, N 20, 1154–6 (1969) (Eng).
REMYGA, S. A., MYASNIKOVA, R. M. and KITAIGORODSKII, A. I., " Example of a mixed binary molecular crystal with double statistical disorder in the arrangement of molecules," *Zh. Strukt. Khim.* **10**, N 6, 1131–3 (1969) (Russ).
SAMARSKAYA, V. D., MYASNIKOVA, R. M. and KITAIGORODSKII, A. I., " X-ray diffraction study of tolan phase crystals in a tolan-diphenyl mercury system," *Kristallografiya* **13**, N 4, 616–21 (1968) (Russ) (*P.A.* **69**: 1200).
TOMCZAK, Z., CHMIELEWSKA, J., PRZEDMOJSKI, J. and TRAMER, A., " Vibration spectra of polysubstituted benzene derivatives. II. Crystal structure and infrared spectra of 2,5-dichloro-1,4-xylene and 4,5-dichloro-1,2-xylene crystals," *Acta Phys. Polon.* **33**, 1025–36 (1968) (Eng) (*P.A.* **68**: 39833).
TSENEVA, M. A., " Polymorphic transformation in organic crystals," *Dokl. Akad. Nauk SSSR* **185**, N 2, 302–5 (1969) (Russ).
WEIR, C. E., PIERMARIN, G. J. and BLOCK, S., " Crystallography of some high-pressure forms of C_6H_6, C_2, Br_2, CCl_4 and KNO_3," *J. Chem. Phys.* **50**, N 5, 2089–93 (1969) (Eng).

13. Some Experimental Techniques

BIRSS, R. R., GIBBS, J. L. and WALLIS, P. M., " A cryostat for use with a torque magnetometer down to 4.2 °K," *J. Phys. E (J. Sci. Instrum.)* **1**, ser. 2, N 1, 15–21 (1968) (Eng).
BOURGOIN, J., ZIZINE, J., SQUELARD, S. and BARUCH, P., " A cryostat for radiation damage experiments at low temperature," *Rad. effects* **2**, N 4, 287–9 (1969) (Eng).
BRADLEY, D. J. and DURRANT, A. J. F., " Generation of ultrashort dye laser pulsed by mode locking," *Phys. Letters* **27A**, N 2, 73–4 (1968) (Eng).
BRYANT, J. I., " A cryostat for the measurement of low-temperature Raman spectra of crystals," *Spectrochim. Acta* **24A**, N 1, 9–14 (1968) (Eng) (*P.A.* **68**: 22941).
COOPER, L. P., " Time-resolved spectroscopy," *GECAEI J. Sci. and Technol.* **35**, N 3, 124 (1968) (Eng).
DEMARIA, A. J., GLENN, W. H., BRIENZA, M. J. and MACK, M. E., " Picosecond laser pulses," *Proc. IEEE* **57**, N 1, 2-25 (1969) (Eng).
DREXHAGE, K. H., " Multiphoton excitation of fluorescence in standing light waves and measurement of picosecond pulses," *Appl. Phys. Letters*, **14**, N 10, 318–20 (1969) (Eng).
DUGUAY, M. A. and HANSEN, J. W., " Direct measurement of picosecond lifetimes," *Optics Communs* **1**, N 5, 254–6 (1969) (Eng).
GEORGHIOU, S., " Effect of resonance energy transfer on donor fluorescence decay; a study by the phase and modulation technique," *J. Phys., B, Proc. Phys. Soc.* **2**, N 10, 1084–9 (1969) (Eng).
MICHON, M., GUILLET, H., LE GOFF, D. L. and RAYNAUD, S., " A subnanosecond risetime electro-optic shutter for use in a laser system," *Rev. Sci. Instrum* **40**, N 2, 263–5 (1969) (Eng).
SPEED, R. and SELINGER, B. K., " Time-resolved electronic spectroscopy. I. Bimolecular rates for excimer formation," *Aust. J. Chem.* **22**, N 1, 9–17 (1969) (Eng).
TREACY, E. B., " Compression of picosecond light pulses," *Phys. Letters* **28A**, N 1, 34–5 (1968) (Eng).
WEBER, H. P. and DANDLIKER, R., " Method for measurement the shape asymmetry of picosecond light pulses," *Phys. Letters* **28A**, N 2, 77–8 (1968) (Eng).

14. Author index