

Russian and Japanese Aerospace Literature

During 1994 the *AIAA Journal* will carry selected abstracts on leading research topics from Russian aerospace literature and, as space permits, from similar Japanese literature. The topics will be chosen and the abstracts reviewed for pertinency by *AIAA Journal* editors. This month features Nondestructive Testing and Evaluation from Russia and Optical Computers from Japan.

Support for assembling and publishing the selected abstracts has been provided by the Innovative Science and Technology Directorate of the Strategic Defense Initiative Organization (SDIO), with the sponsorship and technical management of the abstract service by the Office of Naval Research (ONR) under ONR Grant N00014-93-I-1074.

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Russian Aerospace Literature This month: *Nondestructive Testing and Evaluation*

A93-18329 Selection of methods and equipment for monitoring the technical condition of booster system components (of aircraft hydraulic systems) (Vybor metodov i sredstv kontrolya tekhnicheskogo sostoianiia agregatov busternykh sistem). I. I. MININ, I. S. SHUMILOV, A. V. MILTO, Z. I. RUTKOVSKAIA, and N. P. KUZNETSOV, *Improvement of aircraft maintenance methods* (A93-18326 05-31). Riga, Rizhskii Institut Inzhenerov Grazhdanskoi Aviatsii, 1990, pp. 11-14. 6 Refs.

Methods for monitoring and diagnosing the principal faults of the components of aircraft booster systems are examined. The diagnostic equipment is selected on the basis of an analysis of the principal types of faults. Results of experimental studies concerned with booster system diagnostics are presented.

A93-16825 Principles of diagnostics based on electromagnetism field identification (Printsipy diagnostiki na osnove identifikatsii elektromagnitnykh polei). V. IA. LAVROV and A. P. PUKHANOV, *Tekhnicheskaiia Elektrodinamika* (ISSN 0204-3599), No. 3, May-June 1992, pp. 6-10. 8 Refs.

Basic principles are formulated for the construction of a generalized mathematical model for the diagnostics of equipment on the basis of the theories of electromagnetism field identification, probability, statistics, and pattern recognition. The discussion then focuses on the application of the principles of diagnostics based on the identification of quasi-stationary magnetic fields.

A92-47958 Investigation of the structural inhomogeneity of a titanium alloy (Issledovanie strukturnoi neodnorodnosti titanogo splava). D. V. IORDANOV, N. D. GIZDOVA, I. U. M. SIMEONOVA, and A. V. SHOPOV, *B'lgarska Akademiia na Naukite, Dokladi* (ISSN 0366-8681), Vol. 44, No. 10, 1991, pp. 23-25. 2 Refs.

Inspection of an aircraft engine indicated small cracks of a peculiar type on the titanium ring of the compressor. These cracks were located in a relatively unloaded region; however, under the effect of vibration they could lead to the formation of a 'closed circuit' and to separation of part of the body with subsequent fracture of the compressor. Auger spectroscopy and secondary ion mass spectroscopy were used to analyze the region of ring fracture due to such small cracks. The crack formation was found to be associated with an unusual increase in carbon content in the depthwise direction in the fracture region. This increase may be due to the processing of the material at the metallurgical stage.

A91-35700 Digital filtering during automatic crack detection and measurement in products of composite materials (Tsifrovaia fil'tratsiia pri avtomaticheskoi defektometrii treshchin v izdeliakh iz kompozitsionnykh materialov). V. S. KHANDETSKII and A. T. GRECHKA, *Priborostroenie* (ISSN 0021-3454), Vol. 33, Dec. 1990, pp. 41-46. 8 Refs.

A real-time filtering process is described which allows for the modulation characteristics of defects, composite surface relief, and the rate of change of electrical conductivity along the scanning paths. The filter has been implemented on a specialized microprocessor built into the instrument circuit. The minimal detectable crack depth is 0.5 mm, the accuracy of depth measurements is 8-12 percent or better. A diagram of the filtering algorithm is presented.

A92-44115 Possibilities of nondestructive testing of the properties of carbon-composite components based on magnetic susceptibility analysis (Vozmozhnosti nerazrushaiushchego kontrolya svoistv komponentov uglekompozitov na osnove analiza ikh magnitnoi vospriimchivosti). A. A. ARKHIPOV and I. U. P. RODIN, *Mekhanika Kompozitnykh Materialov* (ISSN 0203-1272), No. 1, Jan.-Feb. 1992, pp. 119-121. 4 Refs.

Magnetic susceptibility of carbon reinforced composites with epoxy and various carbon matrices has been studied in the temperature range of 80 to 300 K with external magnetic fields less than or equal to 10 kOe in two orthogonal directions of the fiber arrangement. It is concluded that the magnetic susceptibility of carbon fibers, epoxy, and carbon matrices differed in signs, absolute volume, and temperature dependence, which makes it possible to determine the fiber and matrix contents and the fiber arrangement in composites.

A92-40707 A feasibility study of computerized X-ray tomography for determining the structural parameters of carbon plastics (Issledovanie vozmozhnostei rentgenovskoi vychislitel'noi tomografii dlia opredeleniia strukturnykh parametrov ugleplastikov). V. I. BARAKHOV, V. D. PROTASOV, and A. V. SUKHANOV, *Mekhanika Kompozitnykh Materialov* (ISSN 0203-1272), No. 6, Nov.-Dec. 1991, pp. 1043-1052. 4 Refs.

A computerized X-ray tomography method for studying the internal structure of carbon plastics is presented. The method is based on obtaining the density matrices of the composites in the examined cross-section. The statistical data obtained by this method make it possible to estimate the distribution of elementary cell density over the thickness and across the surface of the material. Particular attention is given to specific features of the method under consideration, namely, the error analysis of the matrices of the linear attenuation coefficients (LAC). Conversion from LAC matrices to density matrices makes it possible to obtain volume curves for density variation over the thickness and across the surface of the specimens. Histograms of the density distribution in layers of the material are presented. It is concluded that the computerized tomography is an effective method for structure analysis of carbon plastics.

A90-15548 The use of nematic liquid crystals for the nondestructive testing of microelectronic products (Ispol'zovanie nematicheskikh zhidkikh kristallov dlia nerazrushaiushchego kontrolya izdelii mikroelektroniki). N. I. GRITSENKO, S. I. KUCHEEV, and N. V. MOSHEL', (Vsesoiuznaia Konferentsiia po Zhidkim Kristallam, 6th, Chernigov, Ukrainian SSR, Sept. 1988) *Akademiia Nauk SSSR, Izvestiia, Seriia Fizicheskaiia* (ISSN 0367-6765), Vol. 53, No. 10, 1989, pp. 2030-2045. 39 Refs.

A nondestructive testing technique suitable for the quality control of microelectronic products has been developed which employs electrooptical effects in nematic liquid crystals. In comparison with electrochemical, electrographic, electrotopographic, and SEM methods, the nematic liquid crystal method proposed here provides wider possibilities for monitoring various parameters of thin-film products and allows both partial and complete on-line monitoring of layer quality in the production environment while providing sufficient sensitivity and resolution. The method does not require the use of inexpensive equipment and provides direct visualization of defects in the form of an electrooptical response (optical trace).

A93-16773 Prediction of the life of pressed ceramic composite discharge chambers of stationary electric propulsion thrusters using a combination of nondestructive evaluation techniques (Prognozirovanie resursa keramicheskikh press-kompozitsionnykh razriadnykh kamer statsionarnykh elektroraktivnykh dvigatelei sredstvami kompleksnykh nerazrushaiushchikh ispytaniy). I. A. I. BUL'BUK, *Mekhanika Kompozitnykh Materialov* (ISSN 0203-1272), No. 4, July-Aug. 1992, pp. 521-527. 18 Refs.

The problem of the nondestructive testing of pressed nitride composites for the high-temperature dielectric chambers of stationary plasma thrusters is treated by using an approach that represents a further theoretical development of the method proposed by Bulbik and Bychkov (1990). The method involves combining thermal loading with the application of a pulsed electric field. It is shown that, by selecting restrictions on the length of pulsed loading, it is possible to reduce the effect of the transient absorption current on the results of nondestructive test interpretation.

A92-30266 Effect of the specimen geometrical parameters on the mechanical properties and acoustic emission of Al-Mg alloys under conditions of intermittent flow (Vliianie geometricheskikh parametrov obraztsa na mekhanicheskie svoystva i akusticheskuiu emissiiu pri preryvistoi tekuchesti v Al-Mg splavakh). M. M. KRISHTAL and D. L. MERSON, *Fizika Metallov i Metallovedenie* (ISSN 0015-3230), Oct. 1991, pp. 187-193. 9 Refs.

Experiments were conducted to investigate the effect of the specimen thickness on the mechanical properties and acoustic emission characteristics of AMg2, AMg3, and AMg5 alloys during deformation under conditions of intermittent flow. It is found, in particular, that an increase in the deformation rate lowers the general stress level and reduces the normalized level of the acoustic emission envelope; it also decreases the amount of deformation prior to the onset of intermittent flow, the mean serration amplitude, and the deformation band width, while somewhat increasing the serration frequency.

N92-16074 Depth profiling of iron concentration in Fe-Ni structure with PIXE method. A. P. KOBZEV, R. SANDRIK, and R. A. ILKHAMOV, *Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics*. 11P.

The depth distribution of iron in the Fe-Ni structure was studied by applying the PIXE method. The probing depth of the sample was selected by means of proton energy variation. A concentration profile was calculated by modelling the dependence of the experimental X-ray yield on proton energy. The effect of the secondary excitation of iron by K(sub alpha) radiation of nickel was taken into account for the sharply nonuniform depth distribution of iron concentration. It varies from less than 1 percent on the surface to some ten percent at a depth of 10-15 microns. The method allows one to determine the concentration profile of iron with a relative error of about 10 percent near the sample surface and not less than 30 percent at a depth of 15 microns. (DOE)

A92-12778 Determination of the depth of a crack with a small opening displacement from the magnetostatic field of the defect (Opredelenie glubiny treshchiny malogo raskrytiia po znacheniiam magnetostaticheskogo polia defekta). R. S. MEL'NIK, L. N. KROTOV, A. S. SHLEENKOV, V. E. SHCHERBININ, *Defektoskopiia* (ISSN 0130-3082), No. 7, 1991, pp. 89-91. 6 Refs.

An analytical expression is obtained for determining the depth of a crack with a small opening displacement from measurements of the magnetostatic field of the crack. The stability of the formula is demonstrated, and it is shown that the calculated crack depths are accurate to within 15 percent. It is recommended that the transducers used in the measurements be mounted at a height approximately equal to half the expected crack depth.

A92-12777 Development of an acoustic emission method of corrosion identification (Razrabotka akustiko-emissionnogo metoda identifikatsii korrozii). G. B. MURAVIN, I. U. M. PALEI, N. O. MAKAROVA, and I. G. LEVITINA, *Defektoskopiia* (ISSN 0130-3082), No. 7, 1991, pp. 58-65. 8 Refs.

The paper is concerned with the possibility of improving the reliability of the classification of corrosion processes on the basis of the multifactorial analysis of acoustic emission signals. In particular, an acoustic emission method is proposed which provides a reliable classification of plastic deformation and microcrack propagation processes from acoustic emission measurements in terms of mean intensity vs mean event frequency. To demonstrate the method, it is applied to the analysis of the stressed state of silicon iron during a hydrogenation treatment. The experimental procedure and results are discussed.

A91-45000 Methods and equipment for the quality control of composite materials (Metody i sredstva kontrolya kachestva kompozitnykh materialov). I. G. MATIS, *Defektoskopiia* (ISSN 0130-3082), No. 4, 1991, pp. 77-87. 12 Refs.

The applied research carried out at the Polymer Mechanics Institute of the Latvian Academy of Sciences in the field of the nondestructive testing of composite materials is reviewed. Brief descriptions of instruments for the monitoring of the ultrasonic, thermal, electrical, and mechanical characteristics of composites are presented, and their applications are illustrated by examples. Particular attention is given to applied research related to acoustic and dielectric spectrometry.

A91-47477 The main factors affecting errors in ultrasound flaw detection (Review) (Osnovnye faktory, vliiaushchie na pogreshnost' ul'trazvukovoi defektometrii /Obzor/). V. G. SHCHERBINSKII, *Defektoskopiia* (ISSN 0130-3082), No. 5, 1991, pp. 3-32. 65 Refs.

Factors affecting acoustic transmission in an ultrasound flaw detector, which cause errors in estimates of defect dimensions derived from the amplitude mode are examined. These factors include the configuration of the reflector, the roughness of the reflecting surface of a planar defect, the angle of approach of the planar-defect echo, the width of the opening and the filling of the defect cavity, the orientation of the polarization vector, the quality of the acoustic contact, and the curvature of the bottom surface. Special attention is given to the effects of the angle effect and the anticorrosion surface cover. Recommendations for enhancing the accuracy of ultrasound flaw detection are proposed.

A91-41250 An ultrasonic transducer for the inspection of thin-walled products (Ul'trazvukovoi preobrazovatel' dlia kontrolya tonkostennykh izdelii). A. P. ZASTAVA, *Defektoskopiia* (ISSN 0130-3082), No. 3, 1991, pp. 17-24. 12 Refs.

The effect of the buffer material and two impedance-matching layers on the characteristics of an ultrasonic transducer with a delay line of polystyrene is investigated theoretically and experimentally. Recommendations are given concerning the selection of the impedance-matching layer thickness. The performance characteristics of the transducer are discussed. In particular, it is shown that the use of an epoxy-based buffer layer with matching layers of optimum thickness makes it possible to detect defects in aluminum alloys that are equivalent to a flat reflector of 1.2 mm diameter at a depth of 1-15 mm.

A91-35799 Prediction of the fracture of a fiber composite by the numerical experiment method (Prognozirovanie razrusheniia voloknisto-kompozita metodom chislennogo eksperimenta). I. N. ZHDANOVA and D. N. KARPINSKII, *PMTF - Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki* (ISSN 0044-4626), Jan.-Feb. 1991, pp. 114-120. 10 Refs.

An attempt is made to predict the fracture of fiber composites from the results of a computer simulation of fiber fractionation in a loaded composite sample. Details of the method are discussed, and it is noted that the approach can be used for the processing of acoustic emission data in tests on real composite structures, since the signal amplitude is proportional to the elastic energy released during fiber rupture. Localization of acoustic emission signals makes it possible to differentiate between signals emitted from different sections of the specimen and thus to identify the fracture-prone section.

A91-35764 An X-ray diffraction study of microtwinning in polycrystalline high-temperature superconductor YBa2Cu3O(7-x) (Rentgenograficheskoe izuchenie mikrodvoinikovaniia v polikristallicheskom vysokotemperaturnom sverkhprovodnike YBa2Cu3O(7-x)). S. V. RUSHCHITS and I. P. IUDT, *Fizika Metallov i Metallovedenie* (ISSN 0015-3230), Dec. 1990, pp. 167, 168. 8 Refs.

It has been suggested that planar defects may affect the characteristics of high-temperature superconductivity. In YBa2Cu3O(7-x), such defects are represented by disperse microtwins in the (110) plane, which are responsible for internal stress relaxation during the tetragonal-rhombic phase transition. Here, an X-ray diffraction analysis is described which can be used for the quick nondestructive inspection of the twin microstructure of high-temperature superconductors.

A91-19923 Thermal-holographic nondestructive inspection of products made of polymer composite materials (Teplogolograficheskii nerazrushaiushchii kontrol' izdelii iz polimernykh kompozitsionnykh materialov). A. S. BRITAN, D. A. RAPOPORT, O. N. BUDADIN, N. I. SIMAKINA, and E. V. ABRAMOVA, *Defektoskopiia* (ISSN 0130-3082), No. 11, 1990, pp. 82-90.

A nondestructive inspection method combining thermal and holographic techniques, and applicable to products made of polymer composite materials is proposed. The test equipment includes an automatic thermo-holographic device for fault inspection and a mathematical model providing automatic control of the process. The model can be subdivided into two models describing the thermal and holographic inspection separately. Finite element techniques are used to solve the resulting two-dimensional, thermoelasticity problems. Using this method, product defects can be located, characteristics can be determined, and the product's suitability for further use can be evaluated.

A91-11974 Detection of concealed corrosion damage in aircraft structures using the eddy current method (Obnaruzhenie skrytykh korrozionnykh povrezhdenii aviatsionnykh konstrukttsii vikhretkovym metodom). V. N. UCHANIN and V. N. TSIRG, *Fiziko-Khimicheskaiia Mekhanika Materialov* (ISSN 0430-6252), Vol. 26, July-Aug. 1990, pp. 103, 104. 7 Refs.

The objective of the study was to investigate the possibility of using the eddy current method to detect the initial stage of pitting corrosion between stringers and skin panels without disassembling riveted joints or removing the paint. It is shown that eddy current fault detectors are capable of detecting corrosion pits deeper than 0.16 mm (about 5 percent of the thickness) without joint disassembly or paint removal. A procedure for the eddy current detection of local corrosion damage on the inaccessible surfaces of airframe structures has been developed.

A91-23817 Optimization of process routes in the repair of gas turbine engine components using capillary testing (Ratsionalizatsiia marshrutov remonta detalei gazoturbinnnykh dvigatelei, proveriaemykh kapilliarnymi metodami). I. U. A. GLAZKOV, *Defektoskopiia* (ISSN 0130-3082), No. 12, 1990, pp. 76-80. 7 Refs.

Methods are proposed for the optimization of process routes in the repair of gas turbine engine components in order to improve the efficiency of capillary and complex nondestructive testing. The process is optimized by changing the sequence of repair operations, changing the operations themselves, changing test specimen preparation procedures, and changing testing techniques. Examples of repair process optimization are presented for turbine and compressor blades made of a titanium alloy.

A91-23816 Microwave heat testing of carbon composite components (SVCh teplovoi kontrol' kachestva izdelii iz ugleplastika). I. U. P. PLOKHOV and B. G. TSIKIN, *Defektoskopiia* (ISSN 0130D3082), No. 12, 1990, pp. 66-75.

The microwave heating of cylindrical carbon composite sections incorporated into a coaxial waveguide was investigated theoretically and experimentally in an attempt to develop an active thermal fault-detection method. It is demonstrated that the active thermal inspection method using pulsed microwave heating is capable of detecting defects in sections of complex shape and determining their depth. The general design and operation of the pulsed microwave heater are described.

A91-23815 Experimental thermal tomography of solids using one-sided pulsed heating (Eksperimental'naia teplovaia tomografiia tverdykh tel pri impul'snom odnostonnom nagreve). V. P. VAVILOV, T. AKHMED, KH. D. DZHIN, R. L. THOMAS, and L. D. FAVRO, *Defektoskopiia* (ISSN 0130-3082), No. 12, 1990, pp. 60-66.

Dynamic thermal tomography experiments were conducted on non-metal specimens (Delrin plastic and black organic glass) using a computer-controlled system. The system consists of an infrared imager, a microcomputer, a 25.6 kW pulsed heater, and a 60-Mb memory buffer. The possibility of subdividing the plastic specimens into 8 layers up to a depth of about 8 mm is demonstrated. The dynamic thermal tomography algorithm used is briefly described.

A91-23814 Theory of the resonance method for the quality control of adhesive joints (K teorii rezonansnogo metoda kontrolya kachestva kleevykh soedinenii). S. A. FILIMONOV, *Defektoskopiia* (ISSN 0130-3082), No. 12, 1990, pp. 28-36. 15 Refs.

A study is made of the electroacoustic channel of an ultrasonic resonance instrument for the quality control of adhesive joints in aircraft panel structures. The observed differences between the calculations and the experimental data are attributed to the effect of diffraction losses. From the standpoint of the reliability of testing, the unique correspondence between the adhesive joint quality and the frequency characteristic of the ultrasonic piezoelectric transducer is shown to be essential.

A91-15397 Laser equipment for measuring the propagation of surface Rayleigh waves (Lazernaia ustanovka dlia izmereniia skorosti rasprostraneniia poverkhnostnykh voln Releia). P. V. BAZYLEV, A. N. BONDARENKO, and V. A. LUGOVOI, *Defektoskopiia* (ISSN 0130-3082), No. 10, 1990, pp. 91-93. 7 Refs.

Laser equipment used for measuring velocities of surface acoustic waves (SAW) for the purpose of nondestructive inspection is presented. High accuracy of the measurements is achieved as a result of contactless data acquisition. Using this equipment, Rayleigh SAW velocities were measured for the AMg6, AMg2, and ST45 alloys, as well as for bronze.

A91-15396 Problems in the development of a computer microphotography method for the analysis of articles made of composite materials (Voprosy razrabotki metoda komp'iuternoi mikrofotografii dlia analiza izdelii iz kompozitnykh materialov). V. I. LELEKOV, V. G. PYKHITIN, and I. A. SMORODINSKII, *Defektoskopiia* (ISSN 0130-3082), No. 10, 1990, pp. 84-90. 7 Refs.

The development of nondestructive testing equipment using three-dimensional high-resolution computer microphotography is discussed. A mathematical model of the equipment and the requirements that have to be satisfied by its main components are presented. Modular design is suggested for the automated computation units. It is suggested that the complex procedure for calculations can be applied in the solution of a wide variety of scientific tasks.

A91-15395 Prediction of dangerous damage in specimens and thin-walled structural elements under cyclic loading (Prognozirovaniie opasnogo povrezhdeniia v obratzakh i tonkostennykh elementakh konstruktii pri tsiklicheskom nagruzhении). V. V. BULANOV, A. I. POTAPOV, and A. G. SUSLOVA, *Defektoskopiia* (ISSN 0130-3082), No. 10, 1990, pp. 3-6.

A procedure for predicting fatigue cracks in flat metallic specimens under symmetric cycling loading of different stress amplitudes is presented. Experiments are conducted to determine the delamination of three-layer composite panels for aircraft. The results show that the number of cycles obtained through calculations is greater than the number obtained experimentally and that the error is within the allowable limits. A criterion for nondestructive evaluation of parts subjected to cyclic deformation is defined and the relationship between the degree of failure and the critical parameter makes the prediction of failures possible.

A91-12041 Development of ultrasonic adaptive methods and equipment for the inspection of polymer materials (Razrabotka ul'trazvukovykh adaptivnykh metodov i ustroistv dlia kontrolya iz polimernykh materialov). V. K. KACHANOV, O. A. KAZANTSEV, I. V. SOKOLOV, and A. I. U. ZAV'IALOV, *Defektoskopiia* (ISSN 0130-3082), No. 9, 1990, pp. 52-56. 14 Refs.

The general principles underlying the operation of adaptable systems are analyzed, and an algorithm is proposed for the synthesis of an adaptive system for the ultrasonic inspection of composite materials. The general design of the adaptive fault detector proposed here and the functions and operation of its main components are discussed. A structural scheme of the system is presented.

A91-12040 Acoustic methods and equipment for testing products of polymer materials (Akusticheskie metody i sredstva kontrolya izdelii iz polimernykh materialov). V. V. MURASHOV, *Defektoskopiia* (ISSN 0130-3082), No. 9, 1990, pp. 46-52. 10 Refs.

The capabilities and performance characteristics of methods and equipment for the low-frequency acoustic nondestructive testing of products of polymer composites are examined with particular reference to applications in aircraft building. The methods discussed include the impedance method, the velocimetry method, the method of free vibrations, the acoustothermal method, reverberation methods, and the resonance method. The discussion also covers contact liquids and standard test specimens used in low-frequency acoustic testing.

A91-12038 Processing of multidimensional informative signal parameters for the solution of nondestructive evaluation problems (Obработка mnogomernykh informativnykh parametrov signalov dlia resheniia zadach nerazrushaiushchego kontrolya). V. P. AFANAS'EV, A. V. MOZGOVOI, D. A. RAPOPORT, and I. L. IAKIMENKO, *Defektoskopiia* (ISSN 0130-3082), No. 9, 1990, pp. 27-35. 7 Refs.

The paper is concerned with the problem of data compression in automated nondestructive testing systems relying on the use of multidimensional information on the material of the object being tested. A method for selecting the optimal informative parameters and processing them is proposed, which provides a way to improve the reliability of fault recognition and minimize the computation time. The approach proposed here is illustrated by an example.

A91-12036 Reliability of results of the capillary testing of gas turbine engine components during repairs (Dostovernost' rezul'tatov kapilliarnogo kontrolya detalei gazoturbinnnykh dvigatelei pri remonte). I. U. A. GLAZKOV, *Defektoskopiia* (ISSN 0130-3082), No. 7, 1990, pp. 62-70. 12 Refs.

The problem of the reliability of capillary testing in gas turbine repair is examined with allowance for the particular technological route adopted during the repair. Examples of repair procedures that may affect the reliability of the results of capillary inspection are presented. These include chemical and mechanical stripping, grinding, polishing, heat treatment, deposition of chemical, diffusion, and other coatings, surface hardening treatments, and corrosion protection treatments.

A90-52375 Reliability of multiparametric nondestructive testing (O nadezhnosti mnogoparametricheskogo nerazrushaiushchego kontrolya). D. A. RAPOPORT, B. G. FREIDIN, and L. A. SHOR, *Defektoskopiia* (ISSN 0130-3082), No. 8, 1990, pp. 81-87. 5 Refs.

A nondestructive method for determining the condition of composite products is examined whereby the condition of the inspected object is determined from several parameters (attributes). An algorithm is described which minimizes the error probability in the decision on the condition of the inspected object. It is demonstrated that the reliability of nondestructive testing (i.e., the probability of zero error) increases with the number of the attributes used.

A90-52373 Acoustic impedance methods of nondestructive testing (Review) (Akusticheskie impendansnye metody nerazrushaiushchego kontrolya /Obzor/). I. U. V. LANGE, *Defektoskopiia* (ISSN 0130-3082), No. 8, 1990, pp. 3-19. 49 Refs.

Acoustic methods of nondestructive testing are examined which are based on the recording of changes in the impedance of inspected objects while elastic vibrations are excited in these objects. The discussion covers the properties of the acoustic contact between the transducer and the inspected object, methods of impedance measurements, fault detection in the joints of multilayer structures, monitoring of the physicomaterial properties of materials, and mechanical impedance as an intermediate parameters in other methods of nondestructive testing.

A90-43038 A study of the efficiency of the use of repetitively pulsed CO2 lasers for fault detection in metals (Issledovanie effektivnosti primeneniia impul'sno-periodicheskikh CO2-lazeroi dlia defektoskopii metallov). N. P. BIRIUKOVA, V. E. CHABANOV, N. G. BOGORODSKII, V. M. SOKOLOV, V. A. KHAMCHISHKIN et al., *Defektoskopiia* (ISSN 0130-3082), No. 3, 1990, pp. 51-57. 5 Refs.

Results of an experimental study concerned with the possibility of using repetitively pulsed CO2 lasers for the ultrasonic inspection of metals are reported. In particular, the characteristics of laser-generated ultrasound in metals are examined with particular reference to results obtained for steel, brass, and AMg6 alloy. It is shown that the use of industrial CO2 lasers for the nondestructive evaluation of metals is not practical.