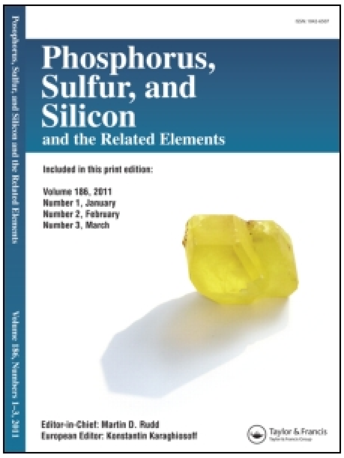


Phosphorus, Sulfur, and Silicon and the Related Elements
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713618290

SYNTHESIS OF SOME SULFUR-CONTAINING SPIROINDOLE DERIVATIVES

Krishna C. Joshi[a]; Diwakar Sharma[a]; Bidya S. Joshi[a]
[a] Department of Chemistry, University of Rajasthan, Jaipur, India

To cite this Article Joshi, Krishna C. , Sharma, Diwakar and Joshi, Bidya S.(1990) 'SYNTHESIS OF SOME SULFUR-CONTAINING SPIROINDOLE DERIVATIVES', Phosphorus, Sulfur, and Silicon and the Related Elements, 48: 1, 33 — 36
To link to this Article: DOI: 10.1080/10426509008045878
URL: http://dx.doi.org/10.1080/10426509008045878

Phosphorus, Sulfur, and Silicon, 1990, Vol. 48, pp. 33–36
Reprints available directly from the publisher
Photocopying permitted by license only

SYNTHESIS OF SOME SULFUR-CONTAINING SPIROINDOLE DERIVATIVES

KRISHNA C. JOSHI*, DIWAKAR SHARMA and BIDYA S. JOSHI
Department of Chemistry, University of Rajasthan, Jaipur-302004, India

(Received July 6, 1989; in final form Aug. 3, 1989)

The synthesis of some new sulfur-containing spiroindole derivatives is reported. Fluorinated 3′-aryl-2′-phenylimino-spiro[3H-indole-3,6′[4,5′-pyrazolin][4,3-d]thiazolo]2(1H)-ones were prepared by the reaction of 5-(2-oxo-3-indolinylidene)-3-aryl-2-phenylimino-4-thiazolidinones with hydrazine hydrate. The compounds have been characterized on the basis of elemental and spectral studies.

Key words: Sulfur-containing spiroindoles; thiazolidinones; doublet; ^{19}F NMR; ^{13}C NMR; chromatography.

INTRODUCTION

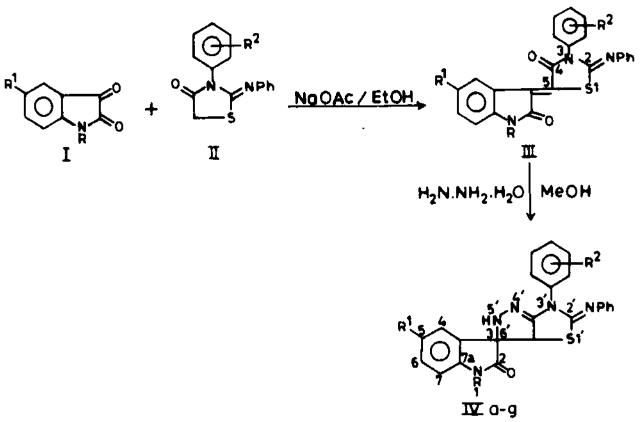
4-Thiazolidinone derivatives are an important class of bioactive compounds and are reported to be potent as pesticides,[1] anti-convulsants[2] and memory enhancers.[3] This class of compounds also exhibits antitubercular,[4] fungicidal[5] antibacterial[6] and anti-viral[6] activities. The pyrazolothiazole derivatives are used as antigungal agents.[7] Although the indole nucleus is recognised as an important bioactive centre,[8,9] yet spiroindole derivatives incorporating both thiazole and pyrazole moieties have not been synthesised. In continuation to our earlier work on the synthesis of spiroindole derivatives of thiazolidinones[10] and pyrazolones,[11] we now report in this communication the synthesis and characterization of some spiroindole pyrazolothiazoles and this is the first report of such sulfur-containing spiroindole derivatives.

DISCUSSION

3′-Aryl-2′-phenylimino-spiro[3H-indole-3,6′[4′,5′-pyrazolin][4,3-*d*]thiazolo]-2(1H)-ones(IV_{a-g}) were prepared by the reaction of hydrazine hydrate with equimolar amounts of 5-(2-oxo-3-indolinyl-idene)-3-aryl-2-phenylimono-4-thiazolidinones (III) (Scheme 1). The latter compounds (III) were prepared by the reaction of dihydro-indole-2,3-diones (I) with 4-thiazolidinones(II). The structures of the synthesized compounds (**IVa–g**) were further established by IR, PMR, ^{13}C NMR and mass spectral studies. Elemental and physical data are given in Table I.

IR *Spectra*

The IR spectra of compounds **IVa–g** show only one strong band in the region 1680 cm^{-1}, which can be attributed to the cyclic imido ν C=O vibration. A



Scheme 1

doublet corresponding to the ν C=N vibration is observed in the region 1510 cm^{-1}. The N—H band is observed in the region 3340 cm^{-1}.

^{1}H *and* ^{19}F NMR *Spectra*

In the PMR spectra of the spiroindole derivatives (**IVa–g**), the signal of the indole ring was observed as a broad band in the region at δ 10.15–8.84 ppm and as earlier reported,[12] the N—H signal of the pyrazoline ring was not observed. The aromatic proton signals were observed in the region at δ 7.93–6.72 ppm and in the compounds **IVf** and **IVg** a characteristic doublet[13] of 4-H aromatic proton at δ 8.43 and 8.09 ppm could be distinguished. The —C—H proton signal was clearly observed in the region 5.69–4.10 ppm. In compounds **IVd** & **IVE**, the ^{19}F signal for the —CF$_3$ group was observed at δ −62.49 & −56.48 ppm and in compound **IVc**, and **IVg**, the C—F signal was observed at δ −114.75 and −123.36 ppm.

^{13}C NMR *Spectra*

The ^{13}C NMR spectra of **IVa** and its precursor (**IIIa**) have been recorded. In **IIIa**, two characteristic signals are observed at δ 184.32 and 169.46 ppm which are attributed to the carbonyl groups of the thiazolidinone ring and cyclic imide group respectively. Compound **IVa** displayed only one signal at δ 170.90 ppm corresponding to the imido carbonyl group, and the signal due to the carbonyl group of the thiazolidinone ring disappeared. The methine carbon was clearly observed at δ 110.70 ppm and the signals of other carbon atoms were observed in the expected region.

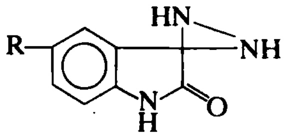
Mass Spectra

The mass spectra of the compounds **IVa** & **IVg** show modes of fragmentation. The [M$^+$] peaks were not observed in the mass spectra of these compounds and their precursors. According to literature information,[12] this is not unusual with spiro cyclic compounds. The spectrum shows peaks corresponding to M$^+$—PhN≡C

TABLE I

Physical and analytical data of the compounds **IVa–g**

S.No.	Compound *R*	*R*^{1}	*R*^{2}	% Yield	M.p. (°C)	M.F.	Anals. % Found (Cal.) *C*	*H*	*S*
IVa	H	H	H	45	223	$C_{23}H_{17}ON_5S$	67.48 (67.15)	4.21 (4.13)	7.35 (7.78)
IVb	$COCH_3$	H	H	62	228	$C_{25}H_{19}O_2N_5S$	66.35 (66.22)	4.26 (4.19)	7.01 (7.06)
IVc	H	5-F	H	50	237	$C_{23}H_{16}ON_5FS$	64.55 (64.33)	3.90 (3.72)	7.24 (7.43)
IVd	H	H	4-CF_3	60	235	$C_{24}H_{16}ON_5F_3S$	60.04 (60.12)	3.39 (3.34)	6.75 (6.68)
IVe	$COCH_3$	H	4-CF_3	50	183	$C_{26}H_{18}O_2N_5F_3S$	59.72 (59.88)	3.40 (3.45)	6.25 (6.14)
IVf	H	H	0-Cl	51	218	$C_{23}H_{16}ON_5ClS$	61.73 (61.88)	3.52 (3.58)	7.26 (7.17)
IVg	H	5-F	0-Cl	60	267	$C_{23}H_{15}ON_5FClS$	59.62 (59.48)	3.28 (3.23)	6.79 (6.89)

ion. The ion at *m/z*, 161 and 179 corresponding to the  cations forms the base peak in the spectrum.

EXPERIMENTAL

Melting points, determined on a Toshniwal melting point apparatus, (capillary method) are uncorrected. The purity of the synthesized compounds was tested by thin layer chromatography on silica gel in various nonaqueous solvents. IR spectra were recorded in KBr on a Perkin–Elmer 577 grating spectrophotometer (ν max in cm^{-1}), PMR spectra in $CDCl_3$ and DMSO-d_6 on Jeol FX 90 Q (89.55 MHz) using TMS as internal standard (^{19}F and ^{13}C NMR on the same instrument), and mass spectra were recorded on Kratz 30 and 50 mass spectrometer at 70 eV.

(i) *Fluorine-containing dihydroindole-2,3-diones* (**I**) *and fluorine—containing 3-aryl-2-phenylimino-4-thiazolidinones* (**II**). These compounds were synthesized by literature methods.[14,15]

(ii) *5-(2-Oxo-3-indolinylidene)-3-aryl-2-phenylimino-4-thiazolidinones* (**III**). These compounds were synthesized by a reported method[16] with some modification. 3-Aryl-2-phenylimino-4-thiazolidinone (II, 0.016 mole), dihydroindole-2,3-diones (I, 0.015 mole), finely-grounded fused anhydrous sodium acetate (0.04 mole) and absolute ethanol (50 ml) were heated under reflux for 4–5 hr.; a dark precipitate appeared during the progress of the reaction. At the end, the reaction mixture was poured into crushed ice and the brownish-red precipitate, which separated was filtered, washed with water and ethanol and dried, to give the title compounds. Yields, 60–70%; m.p. > 300°.

(iii) *Synthesis of 3′-aryl-2′-phenylimino-spiro[3H-indole-3,6′-[4′,5′-pyrazolin][4,3-d]thiazolo]-2(1H)-ones* (**IVa–g**) 5-(2-Oxo-3-indolinylidene)-3-aryl-2-phenylimino-4-thiazolidinone (III, 0.01 mole) and hydrazine hydrate (0.012 mole) were heated under reflux in methanol (25 ml) for 5–6 hrs. On cooling, crystals of the title compounds (**IV**) separated which were filtered and recrystallized from a mixture of methanol and chloroform. All ^{1}H and ^{13}C NMR signals of **IVa** are given below:

^{1}H NMR: 10.15 (s, N—$\underline{H}$); 7.36–6.73 (m, Ar—$\underline{H}$), and 5.62 (s, —C$\geqslant\underline{H}$).

^{13}CNMR: 170.90 (>C=O), 156.41, 156.12, 147.59, 143.78, 141.58, 132.40, 131.92, 131.03, 129.12, 126.62, 118.69, 118.04, 117.80, 116.73, 115.53, 114.70, 114.28, 110.70 ($\geqslant$C—H) and 110.77.

ACKNOWLEDGEMENT

Financial support from the University Grants Commission, New Delhi is gratefully acknowledged.

REFERENCES

1. G. Kratt, G. Selbeck, W. Bonin, K. Bauer, H. Bieringer and B. Sachse; German Patent 3,505,432 (1987); *Chem. Abstr.*, **106**, 1844 (1987).
2. N. J. Gaikwad, B. R. Bambhulkar and S. N. Umathe; *Indian Drugs* **23**, 384 (1986).
3. I. Ueda and Y. Katsura; Eur. Patent, 203,743 (1987); *Chem. Abs.*, **106**, 67300 (1987).
4. N. M. Turkevich, L. Ya. Lodnaya, V. I. Pleshnev and O. L. Grom; *Khim. Issled. Farm.*, 64 (1970); *Chem. Abs.*, **76**, 34154 (1972).
5. B. F. Rose, U.S. Patent, 4,639,460 (1987); *Chem. Abs.*, **106**, 156456 (1987).
6. M. I. Shukla and Sharveshwar, *Indian J. Chem.*, **25B(5)**, 549 (1987).
7. V. N. Mehrotra and R. S. Achori, *J. Indian Chem. Soc.*, **6**, 306 (1985).
8. C. A. Damerson, L. G. Henber, A. M. Philip and R. P. Martel, *J. Med. Chem.*, **19**, 391 (1976).
9. M. J. Kornet and A. P. Thio, *J. Monatsh Chemie*, **19**, 592 (1976).
10. K. C. Joshi, R. Patni and P. Chand, *Heterocycles*, **16**, 1555 (1981).
11. K. C. Joshi, R. Jain and S. Garg, *Pharmazie*, **40**, 21 (1985).
12. H. Otomasu, T. Tanaka and M. Aoyaci, *Chem. Pharm. Bull.*, **24**, 782 (1976).
13. H. J. Brandman, *J. Heterocycl. Chem.*, **10**, 383 (1973).
14. Y. O. Yen, N. P. Buu-Hoi and N. D. Xuong, *J. Org. Chem.*, 1858 (1958).
15. J. Sahu, S. S. Meher, S. Naik and A. Naik, *J. Indian Chem. Soc.*, **62**, 70 (1985).
16. R. P. Rao and Sarala Raj, *J. Indian Chem. Soc.*, **50**, 366 (1973).