the polar resonance form must make an appreciable contribution to the over-all structure of the molecule.

Bates and Hobbs claim that the low basicity of the amide group is due mainly to dipole interaction. Since dipole interaction opposes a coplanar configuration, it is logical to conclude that if this effect is stronger than the resonance effect, the structure they have assumed for their calculations would not exist.

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SAN FRANCISCO 22, CALIF. RECEIVED JULY 3, 1951

The Infrared Spectrum of Disulfur Decafluoride

BY D. EDELSON

Disulfur decafluoride, S_2F_{10}, is one of the fluorides of sulfur formed when sulfur is heated in a fluorine atmosphere; its properties have been described by Denbigh and Whytlaw-Gray.[1] It may be obtained as a by-product in the production of sulfur hexafluoride and is frequently present in the latter as impurity. In this work the infrared spectrum of this compound is reported as a means of comparing its structure to that of SF_6 of which it may be considered a dimer.

Measurements[2] were made on a double-beam spectrophotometer using a four-inch cell with potassium bromide windows. A sodium chloride prism was used to cover the range 2.5–15 μ, and a potassium bromide prism for 15–22 μ. The spectrum was measured at two pressures, 4 mm. and 37 mm. Results are shown in Fig. 1. The bands and their intensities are given in Table I.

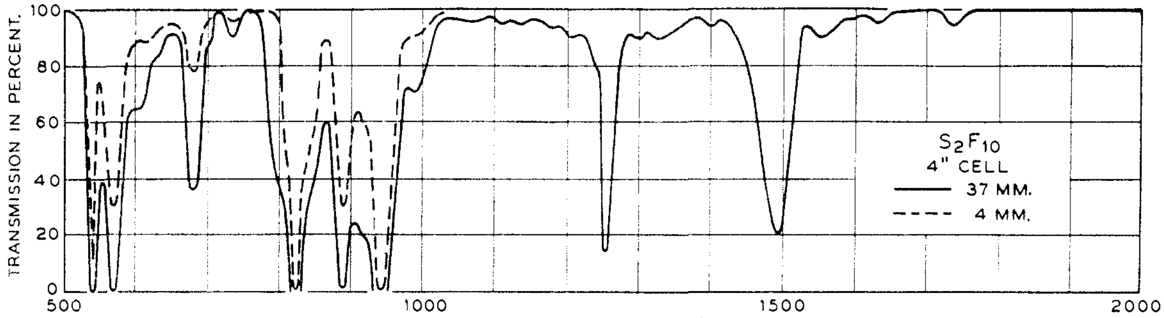

Fig. 1.—The infrared spectrum of S_2F_{10}.

TABLE I

INFRARED BANDS OF S_2F_{10} (CM.$^{-1}$)

vs, very strong; s, strong; m, medium; w, weak; vw, very weak

544	s	1182	w
576	s	1206	w
605	w	1242	m
683	m	1256	s
733	w	1299	w
827	vs	1323	w
890	s	1404	w
917	s	1497	s
940	vs	1550	w
988	m	1629	w
1107	vw	1736	w
1130	vw		

S_2F_{10} may be assumed to consist of two half-octahedra of five fluorine atoms about a central sulfur atom, in analogy with the structure of SF_6, joined by a S–S bond. Although the fundamentals cannot be definitely assigned without further knowledge of the extent of rotation about the S–S bond,[3] and without the Raman spectrum, some tentative assignment may be made by a comparison with the spectrum of SF_6. The vibration of the plane of four fluorine atoms with respect to the central sulfur atom in SF_6 is given by the F_{1u} fundamental[4] at 940 cm.$^{-1}$; the corresponding vibration in S_2F_{10} may be assigned to the very strong band at 940 cm.$^{-1}$. This band in S_2F_{10} is considerably stronger than that in SF_6, undoubtedly because there are twice as many vibrating groups per molecule.

It is questionable whether a S–S vibration should be expected to appear in the infrared; if this may be assumed, however, the bands at 544 or 576 cm.$^{-1}$ may be attributed to this in comparison with the value 512 cm.$^{-1}$ reported by Venkateswaran[5] for this frequency in S_2Cl_2.

The assistance of Mr. K. H. Storks and Mrs. M. H. Read in the experimental work is gratefully acknowledged.

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[1] K. G. Denbigh and R. Whytlaw-Gray, *J. Chem. Soc.*, 1346 (1934).

[2] The sample used in these experiments was obtained through the courtesy of the Pennsylvania Salt Mfg. Co., Chestnut Hill, Phila., Pa.

[3] NOTE ADDED IN PROOF: S. H. Bauer, in a paper presented at the 120th meeting of the American Chemical Society at New York, September 6, 1951, Symposium on Bond Strengths, reported the existence of some hindered rotation despite an abnormally long S–S bond distance.

[4] R. T. Lagemann and E. A. Jones, *J. Chem. Phys.*, **19**, 534 (1951).

[5] S. Venkateswaran, *Ind. J. Phys.*, **6**, 275 (1931).

BELL TELEPHONE LABORATORIES
MURRAY HILL, N. J. RECEIVED AUGUST 27, 1951

Silicon Disulfide and Silicon Diselenide[1a]

BY HENRY GABRIEL[1b] AND C. ALVAREZ-TOSTADO

The fact that silicon and the sulfur family elements react to form binary compounds has been known since the discovery of these elements and

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[1a] Extract from a dissertation prepared under the direction of Prof. Alvarez-Tostado and submitted to the Dept. of Chemistry of Stanford University by Henry Gabriel in partial fulfillment of the requirement for the degree of Doctor of Philosophy.

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