than the 365 mμ (singlet → singlet) absorption band for the compound. The maxima correspond quite well with the previously observed vibrational structure of the singlet → triplet transition of phenazine in methyl iodide at 655, 625, 588, 545, and 510 mμ.[8] For polystyrene film a magnetic rotation maximum was observed at 335 mμ, quite close to the triplet-state absorption region for toluene at 347 mμ.[9]

With polymethylmethacrylate, a normal Faraday effect was obtained; however, no magnetic rotation peaks were observed at wave lengths longer than 360 mμ. The above results demonstrate that magnetic rotatory dispersion measurements are useful for detecting the triplet states of certain molecules. A literature search showed that the use of magnetic rotations to detect triplet states is inherent in the theory of the Faraday effect[10] for diatomic molecules. Some experimental evidence for this has been obtained for such molecules as I_2,[11] ICl and IBr.[12] This communication illustrates that the method is also applicable to certain organic compounds and polymers. We are now engaged in examining the scope and utility of magneto-optical rotation spectroscopy.[13]

(8) R. W. Harrell, Ph.D. Thesis, Florida State University, Tallahassee, Florida, January, 1959.

(9) D. S. McClure, *J. Chem. Phys.*, **17**, 905 (1949).

(10) R. Serber, *Phys. Rev.*, **41**, 489 (1932).

(11) T. Carroll, *ibid.*, **52**, 822 (1937).

(12) W. H. Eberhardt, Wu-chieh Chung and H. Renner, *J. Mol. Spectroscopy*, **3**, 664 (1959).

(13) The author wishes to thank Drs. H. Kobsa and R. W. Harrell of the Du Pont Company for helpful discussions.

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A NEW TYPE OF ALUMINUM HYDRIDE ADDUCT

Sir:

The Lewis adduct between N,N,N′,N′-tetramethylethylenediamine and aluminum hydride, which we have recently prepared, probably constitutes the first example of chelation in compounds of this type. This substance, in addition to being thermally more stable than any previously prepared adduct of aluminum hydride, yields information which may have important consequences affecting the structures of all di-adducts of aluminum hydride.

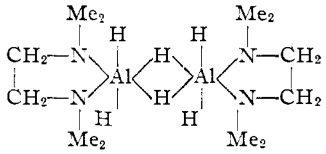
The new compound has been prepared by two procedures, the first of which involved the action of the diamine dihydrochloride on lithium aluminum hydride in an excess of the diamine as a solvent.[1] However, a more convenient route involved treatment of bis-(trimethylamine)-aluminum hydride with an excess of the tertiary diamine at room temperature. In one such preparation,

$$\mathrm{2LiAlH_4 + Me_2NCH_2CH_2NMe_2 \cdot 2HCl \xrightarrow{Me_2NCH_2CH_2NMe_2} 2H_2 + 2LiCl + 2H_3Al \cdot Me_2NCH_2CH_2NMe_2}$$

$$\mathrm{AlH_3 \cdot 2NMe_3 + Me_2NCH_2CH_2NMe_2 \longrightarrow 2NMe_3 + AlH_3 \cdot Me_2NCH_2CH_2NMe_2}$$

carried out in a tensimeter, 0.473 mmole of $AlH_3 \cdot 2NMe_3$ was found to absorb 0.467 mmole of the diamine and, simultaneously, to release 0.949 mmole of trimethylamine.

The adduct prepared in the above manner was a white solid whose vapor pressures at 99.3° and 119.2° were 1.5 mm. and 10.6 mm., respectively. When a sample prepared using 0.20 mmole of $AlH_3 \cdot 2NMe_3$ as a starting material was completely vaporized at 125°, 0.101 mmole of vapor was found to be present. This indicates that the diamine adduct in question is a dimer. We feel that dimerization occurs through hydrogen bridging, rather than through the difunctional amine, and propose the structure



Each of the aluminum atoms is 6-coördinate, probably with an octahedral configuration.

Infrared spectra of $AlH_3 \cdot 2NMe_3$ and of $(AlH_3)_2 \cdot (Me_2NCH_2CH_2NMe_2)_2$ both show identical Al–H stretch absorptions at 5.90μ, from which one is tempted to infer that the two substances have closely related structures, and, particularly, that $AlH_3 \cdot 2NMe_3$ is dimeric in the vapor phase. (Determining the molecular size of $AlH_3 \cdot 2NMe_3$ directly by tensimetry is not convenient, owing to the pronounced tendency for this substance to dissociate.) Our proposed structure for this substance makes it unnecessary to invoke a pentacovalency for the aluminum atom.

Unlike other AlH_3 adducts, $(AlH_3)_2 \cdot (Me_2NCH_2CH_2NMe_2)_2$ showed no tendency to decompose over a 24-hour period at 133°. At the end of this time the ratio of aluminum to hydrogen liberated on hydrolysis was 1.00 to 3.01.

The authors are grateful to the Office of Naval Research for financial assistance in this program.

(1) This is a modification of the general method developed by Ruff and Hawthorne (THIS JOURNAL, **82**, 2141 (1960)) for the preparation of amine adducts of aluminum hydride.

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MAGNETIC OBSERVATIONS OF SOME SUBSTITUTED NICKEL(II) SALICYLALDIMINE COMPLEXES

Sir:

Recently Sacconi, *et al.*,[1,2] have reported magnetic moments (0.5–1.6 B.M.) of N-alkylsalicylaldimine Ni(II) complexes over a temperature range in the fused state and in dibutyl phthalate solution. They interpret their results in terms of a distribution of individual planar molecules over low-lying singlet and triplet states,[3,4] thus accounting for the partial paramagnetism. This anomalous magnetic behavior whereby certain apparently

(1) L. Sacconi, R. Cini, M. Ciampolini and F. Maggio, THIS JOURNAL, **82**, 3487 (1960).

(2) L. Sacconi, R. Cini and F. Maggio, *ibid.*, **79**, 3933 (1957).

(3) C. J. Ballhausen and A. D. Liehr, *ibid.*, **81**, 538 (1959).

(4) G. Maki, *J. Chem. Phys.*, **29**, 1129 (1958).