Electron Spin Resonance Spectrum of a Vanadium–Arsine Complex

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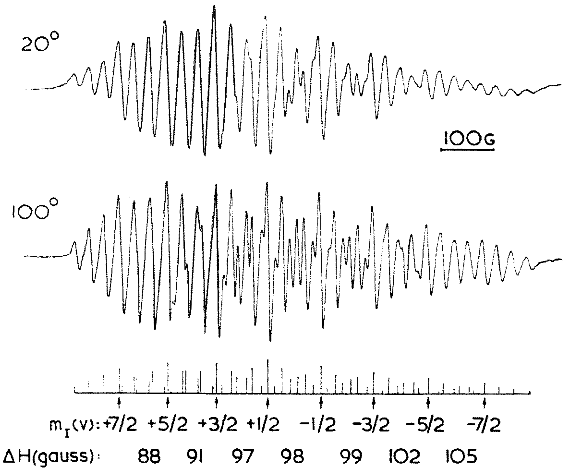

FIGURE. *E.s.r. signal observed for a solution of* VCl$_3$ *and* (C$_4$H$_9$)$_2$As–CH=CH$_2$ *in toluene.*

IF VCl$_3$ is dissolved, in the presence of dibutylvinylarsine, in tetrahydrofuran or toluene, the solution shows the e.s.r. signal shown in the Figure. The signal is due to the interaction of the unpaired electron(s) of a vanadium species with the ^{51}V nucleus ($I = 7/2$, 100% natural abundance) and with two equivalent ^{75}As nuclei ($I = 3/2$, 100% natural abundance), the latter giving rise to a septet splitting (1 : 2 : 3 : 4 : 3 : 2 : 1) of each of the eight vanadium lines. Nearly all of the 56 lines may be detected at 100° (*cf.* diagram). The spectrum shows the usual pecularities of vanadium spectra, *i.e.* unsymmetric line broadening and second-order effects of the hyperfine splittings of the vanadium.[1] The e.p.r. spectroscopic parameters are a_V = 98 gauss, a_{As} = 29 gauss, apparent g-factor 1·990 (ν = 9·24 GHz).

The e.s.r. evidence indicates the presence of a complex containing two arsine molecules bonded to a vanadium species. From the signal level it may be estimated that the signal-producing complex accounts for less than 10% of the total vanadium present. The valency state of the transition metal in the complex is still uncertain. According to present knowledge a V^{III} species ($3d^2$) would not be expected to show an e.s.r. signal due to extremely high zero-field splitting.[2]

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[1] R. N. Rogers and G. E. Pake, *J. Chem. Phys.*, 1960, **33**, 1107.

[2] G. M. Zverev and A. M. Prokorov, *Sov. Phys.* (*JETP*), 1958, **7**, 707.