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In order to understand the nature of the bonding of the bridging and terminal dimethylamino-groups to the beryllium atoms, several factors must be considered. The n.m.r. work by Fetter has shown that there are two methyl resonances ( $\tau$  4.28 and  $\tau$  4.90 in benzene) in the ratio 1:2. Extension of this work to the measurement of the  $^{13}\text{C}$ -H spin-spin coupling constants has led to interesting results. For the protons in the terminal dimethylamino-groups,  $J(^{13}\text{C}\text{-H}) = 138$  c./sec. A coupling constant of this magnitude for a methyl group bonded to a three-co-ordinate nitrogen atom is indicative of a degree of  $\pi$ -bonding between the nitrogen and beryllium atoms.<sup>6</sup>  $\pi$ -Bonding is also substantiated by the geometry, since a terminal beryllium atom, the nitrogen atoms to which the beryllium atom is co-ordinated, and the carbon atoms of the methyl groups on the terminal nitrogen atom are coplanar. Essentially unhybridized  $p$ -orbitals on both the terminal nitrogen and beryllium atoms are then free to form a dative  $\pi$ -bond. In the terminal dimethylamino-group the observed C-N-C bond angle of  $102^\circ$  is much smaller than the expected angle if the nitrogen atom is assumed to exhibit  $sp^2$  hybridization, but this may be accounted for, in part, by

classical electrostatic repulsion arguments.<sup>7</sup> The Be(terminal)-N(terminal) bond length of 1.56 Å may be compared with distances of 1.61 Å for Be(terminal)-N(bridge), and 1.76 Å for Be(central)-N(bridge). This trend is in the expected direction if  $\pi$ -bonding effects are considered. However, further refinement is needed before a quantitative comparison of these distances can be made. The N-C bond lengths (1.52 Å) in the terminal dimethylamino-groups are not significantly different from those (1.53 Å) in the bridging dimethylamino-groups.

For the protons in the bridging dimethylamino-groups, the  $^{13}\text{C}$ -H spin-spin coupling constant is also *ca.* 138 c./sec. However, this does not necessarily indicate  $\pi$ -bonding, since a coupling constant of this magnitude is normal for a methyl group bonded to a four-co-ordinate nitrogen atom.<sup>6</sup>

Further structural and n.m.r. experiments being undertaken at this time with  $[\text{Be}(\text{NMe}_2)_2]_3$  and with  $[\text{Be}(\text{O}^t\text{Bu})_2]_3$  should help to clarify the nature of the bonding in these complexes.

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