

## A Monomeric Aldiminoborane and Evidence for BN $\pi$ -Bonding

By V. A. DOROKHOV and M. F. LAPPERT\*

(The Chemical Laboratory, University of Sussex, Brighton BN1 9QJ)

THE question of BN  $\pi$ -bonding has attracted much attention (*e.g.*, see ref. 1 for the most recent paper), but solely with respect to aminoboranes. We now report the results of a new approach.

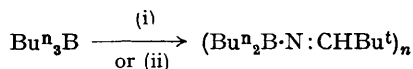
Di-n-butyl-(t-butylaldimino)borane, b.p. 72—75°/0.3 mm., m.p. 74—76°, was prepared by the two reactions shown below. Although it is dimeric in benzene solution, it is monomeric in the vapour at  $> \sim 70^\circ$ , as is evident from (i) the b.p. (*cf.*,<sup>2</sup> Bu<sup>n</sup><sub>2</sub>BNEt<sub>2</sub>, b.p. 77°/0.3 mm., which has a similar molecular weight), (ii) the vapour density at  $\sim 110^\circ$  (we thank Dr. J. D. Smith for this result), and (iii) the mass spectrum. The infrared spectrum of the monomeric vapour has a strong band at 1840—1850 cm.<sup>-1</sup>, which is absent in the dimer; the latter has, instead, a strong band at  $\sim 1670$  cm.<sup>-1</sup> The very-high-frequency band found in the spectrum of the monomer is consistent with the postulate of there being a significant degree of BN  $\pi$ -bonding. This is emphasized

by the canonical form  $\overset{-}{\text{B}}=\overset{+}{\text{N}}=\text{C}<$ ; an implication is linearity at nitrogen. Thus, an iminoborane, like an allene (and other cumulative

systems), is characterized by an asymmetric stretching vibration at high wavenumber.

The C=N stretching vibration in related monomeric silicon compounds (in which SiN  $\pi$ -bonding is not likely to be so significant) falls<sup>3</sup> at 1600—1700 cm.<sup>-1</sup>, and the BN stretching vibration in monomeric aminoboranes generally<sup>4</sup> lies at 1350—1500 cm.<sup>-1</sup>

Earlier attempts to make iminoboranes have invariably afforded dimers,<sup>5,6</sup> (but see Wade and his co-workers;<sup>7</sup> we thank Dr. Wade for exchange of information), although in one case evidence of a transiently stable monomeric intermediate was obtained.<sup>5</sup> The present result is attributed, in part, to a choice of substituents at boron and carbon which ensures some degree of steric hindrance towards dimerization.



(i) Bu<sup>t</sup>CN; 150—160°

(ii)  $\frac{1}{2}\text{Et}_3\text{N}\cdot\text{BH}_3 + \frac{3}{2}\text{Bu}^t\text{CN}$ ; 110—130°

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<sup>4</sup> K. Niedenzu and J. W. Dawson, "Boron-Nitrogen Compounds", Springer Verlag, Berlin, 1965.

<sup>5</sup> B. M. Mikhailov, V. A. Dorokhov, and I. P. Yakovlev, *Izvest. Akad. Nauk S.S.S.R., Ser. Khim.*, 1966, 332.

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<sup>7</sup> J. R. Jennings, I. Pattison, C. Summerford, K. Wade, and B. K. Wyatt, *Chem. Comm.*, 1968, 027.