

## The Reaction of Alkyl Isocyanides with Decaborane-14

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THERE have been several recent reports concerning the novel reactions of alkyl and aryl isocyanides with diborane-6<sup>1</sup> and trialkylboranes.<sup>2-5</sup> We have found that ethyl isocyanide reacts with one equivalent of decaborane-14 in benzene at room temperature to produce an initial deep purple solution which fades within one hour leaving a white precipitate(I). Only a very small amount of hydrogen gas is evolved during the reaction. The crude product can be purified by recrystallization from hot water or sublimation at 190° (10<sup>-5</sup> mm.), m.p. 234—235°. The molecular formula is substantiated by a cut-off in the mass spectrum at *m/e* 179 which corresponds to the <sup>12</sup>C<sub>3</sub><sup>1</sup>H<sub>19</sub><sup>11</sup>B<sub>10</sub><sup>14</sup>N<sup>+</sup> ion.

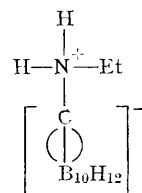
The infrared spectrum of (I) (hexachlorobutadiene and nujol mulls) exhibits  $\nu_{\max}$  3228, 3203, 3180, 3125, and 1575 cm<sup>-1</sup>. Deuterium exchange of (I) in D<sub>2</sub>O causes a shift of the infrared peaks given above to  $\nu_{\max}$  2415, 2405, 2360, 2320, and 1080 cm<sup>-1</sup>. These frequencies are similar to those assigned to N-H stretching and deformation modes in a large number of secondary amine salts studied by Heacock and Marion.<sup>6</sup>

The p.m.r. of (I) (in perdeuteroacetone) exhibits signals at  $\tau$  2.49 (broad singlet, 2H); 6.59 (quartet, *J* = 7.5 c./sec., 2H) and 8.66 (triplet, *J* = 7 c./sec., 3H).

When (I) is treated with excess of sodium hydride two equivalents of hydrogen are evolved based on

the quantity of (I) used. Subsequent treatment with dimethyl sulphate produces a dimethyl derivative of (I). The p.m.r. of the dimethyl derivative indicates that the two methyl groups are equivalent and have a chemical shift ( $\tau$  6.83) expected for methyls attached to a quaternary nitrogen.

This information prompts us to make the tentative suggestion that (I) has the gross structure shown in the accompanying figure.



Thus (I) would be a derivative of the unknown B<sub>10</sub>CH<sub>13</sub><sup>-</sup> ion which is isoelectronic with the known B<sub>9</sub>C<sub>2</sub>H<sub>13</sub> and B<sub>11</sub>H<sub>13</sub><sup>2-</sup> molecules.<sup>7,8</sup> If this structure proves correct, this represents the second example of a one-carbon carborane-like molecule.<sup>9</sup>

The n-propyl and t-butyl analogues of (I) have also been prepared and their properties serve to confirm the findings described above.

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