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# Reduction of Carbonyl Compounds with (±)-2-Trimethylsilyl-2,3-dicarba-*nido*-hexaborane(8)**

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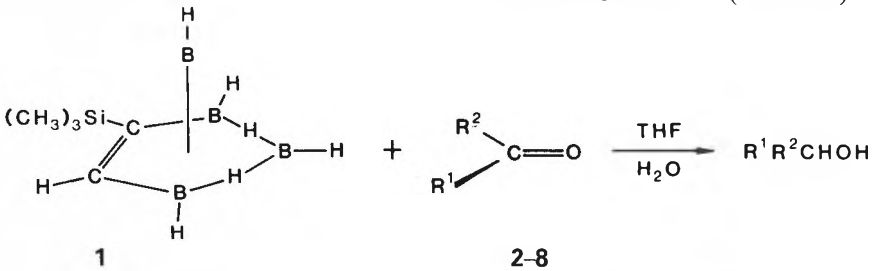
*Abstract:* The racemic *nido*-carbaborane **1** reduces aldehydes and ketones but not styrene after addition of small amounts of water.

The organic chemistry of carbaboranes ("carboranes")[1] with their intriguing structural features, has hardly been explored. Particularly attractive are those carbaboranes, which lack planes of symmetry and consequently are chiral compounds. In an effort to explore organic reactions of such carbaboranes, we have investigated the reduction of some carbonyl compounds by the racemic *nido*-carbaborane **1**[2].




**1** **2–8**

For the first time is has been shown that *nido*-carbaboranes are indeed reducing agents. When equimolar amounts of the carbaborane **1** and a carbonyl compound (**2**–**5**) were mixed in [$^2H_8$]tetratydrofuran at room temperature, reduction occurred rapidly after addition of a small amount of water. The carbonyl compounds **2**–**4** and **7** were reduced to the corresponding alcohols rapidly and in essentially quantitative yield (determined by $^1$H-NMR). The ketone **5** gave, under the same conditions, only a 50% yield. This may be due to the decomposition of **1**, which occurs concomitantly with the reduction, giving $H_2$ and boric acid. During reduction of ketone **5** with **1** no evidence ($^1$H-NMR) could be

| | $R^1$ | $R^2$ | | $R^1 + R^2$ |
|---|---|---|---|---|
| **2** | $C_6H_5$ | H | **6** | $(CH_2)_4$ |
| **3** | $C_6H_5CH(CH_3)$ | H | **7** | $(CH_2)_5$ |
| **4** | $C_6H_5CH{=}CH$ | H | **8** | $(CH_2)_6$ |
| **5** | $C_6H_5CH_2$ | $CH_3$ | | |

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found for the formation of diastereomeric intermediates.

In a further experiment before and after addition of water it has been shown, that styrene is stable. Reductions of the ketones **5–8** occur at relative rates, which are comparable to those of the corresponding reactions of "borohydride" [3].

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[1] R. N. Grimes: *Carboranes*, Academic Press, New York (1970).

[2] Compound **1** was prepared according to W. A. Ledoux, R. N. Grimes, *J. Organomet. Chem. 28* (1971) 37, and obtained after purification by preparative GLC (Apiezon L 20%, column temperature 150 °C) in a yield of 6% as a water- and oxygen-sensitive liquid. $^{11}$B-NMR: $\delta = -20.4$(m) and $-72.4$(d, $J = 174.7$ Hz) with sodium tetraphenylborate as internal standard. Elemental analysis: found for $C_5H_{16}B_4Si$ (%) C 41.18, H 10.83; calculated C 40.71, H 10.93.

[3] H. C. Brown, K. Ichikawa, *Tetrahedron 1* (1957) 221.