9-Borabicyclo[3.3.1]nonane (9-BBN)

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Preparation

9-BBN is simply prepared via a cyclic hydroboration reaction of 1,5-cyclooctadiene. In comparison with other boranes, the dimeric solid exhibits remarkable thermal stability, permitting hydroboration over a range of temperatures (0-100°C) and storage in an inert atmosphere for indefinite periods.

In the solid state 9-borabicyclo[3.3.1]nonane exists as an easily handled dimer \((9\text{-BBN})_2\), which readily dissociates in solution, to give the active monomeric species. 9-BBN is a very versatile reagent, tolerant of many functional groups, facilitating highly selective hydroboration and selective reductions. Facile conversion to B-substituted-9-BBN offers a wide variety of selective transformations such as reductions, C-C bond forming reactions and stereoselective crossed aldol reactions.

Abstracts

(1) 9-BBN achieves excellent chemoselectivity in the hydroboration of nonsymmetrical dienes, resulting in the anti Markovnikov products, often in >99% selectivity.

(2) Selective reduction of many functional groups can be achieved with 9-BBN, for example, the reduction of tertiary lactams to cyclic amines. However, no reduction of nitro groups, alkyl halides and aryl halides is seen and conversion of groups such as epoxides and nitriles is slow.

(3) Carbon-carbon bond formation via palladium-catalysed cross-coupling reactions of alkyl and alkenyl boranes allows synthesis of a wide variety of highly functionalised compounds.

References and Notes


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