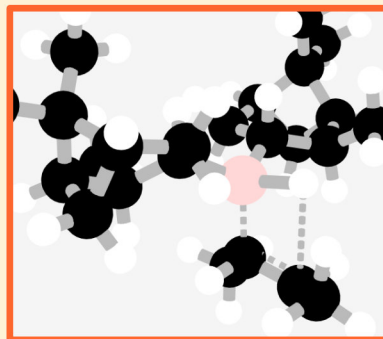


HIGHLIGHTS

- Revision of hydroboration-oxidation
- Substrate controlled hydroboration
- Addition to cyclic substrate (pinene)
- Addition to acyclic substrate (allylic stereocenter)
- Reagent controlled hydroboration using pinene derivatives



Hydroboration of an alkene can be highly stereoselective. Steric factors influence which face of the alkene attacks the organoborane.

This allows **substrate controlled** hydroboration, where a stereocenter within the reactant controls the interaction between reactants. It is also possible to move the stereocenters onto the reactant and have **reagent controlled** hydroboration. The two pinene-derived reagents discussed here are the classic examples of asymmetric reagent controlled hydroboration. They provide a useful framework with which to introduce many of the concepts used to rationalize stereochemical induction. But, better, more reactive and/or more selective organoboranes have been developed. This summary isn't meant to be review of asymmetric reagent controlled hydroboration so all I'll say is that you could do a lot worse than look at [Angew. Chem. Int. Ed. 2009, 48, 1896](#) or [Chem. Soc. Rev. 2022, 51, 8877](#).

CHEMISTRY CLASSICS

π NUCLEOPHILES PART 3

ASYMMETRIC HYDROBORATION

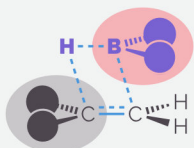
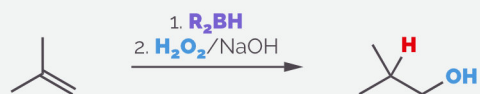


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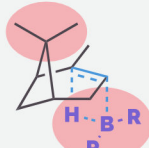
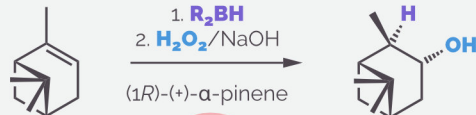
Asymmetric hydroboration

1. Hydroboration



Sterics controls:
regiochemistry - anti-Markovnikov
stereochemistry - least hindered face

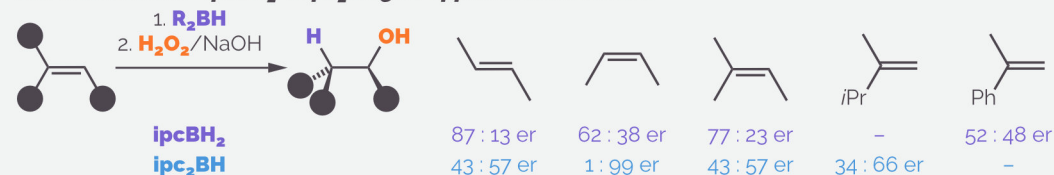
2A. Substrate control



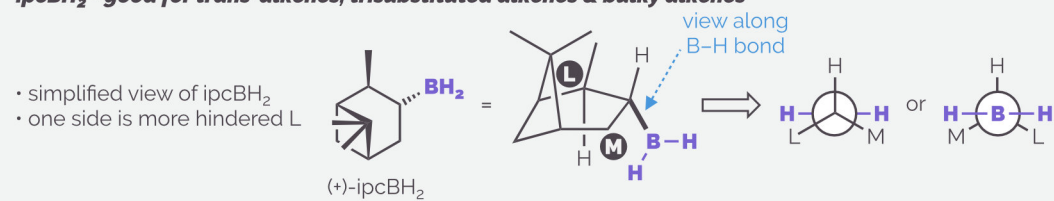
regiochemistry - B adds to least hindered end
stereochemistry - B-H on least hindered face

3. Reagent control: pinene derivatives

General reaction - $ipcBH_2$ & ipc_2BH give opposite enantiomers

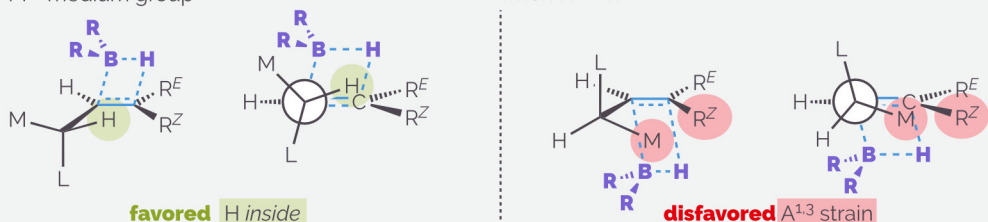
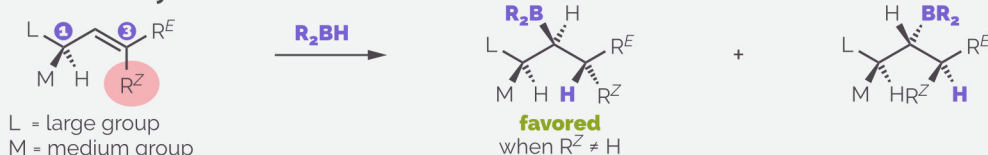


$ipcBH_2$ - good for trans-alkenes, trisubstituted alkenes & bulky alkenes

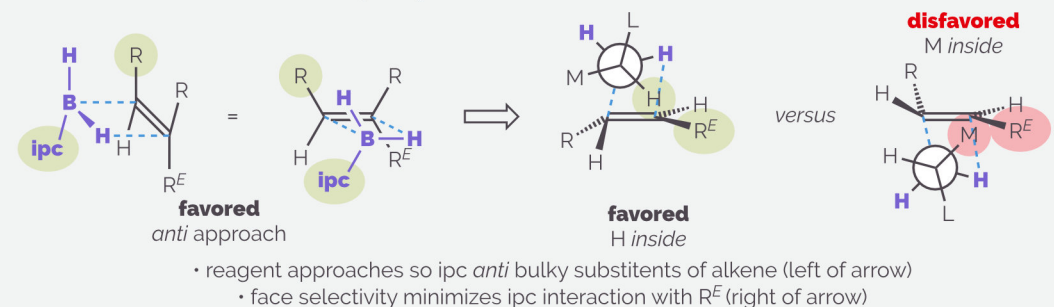
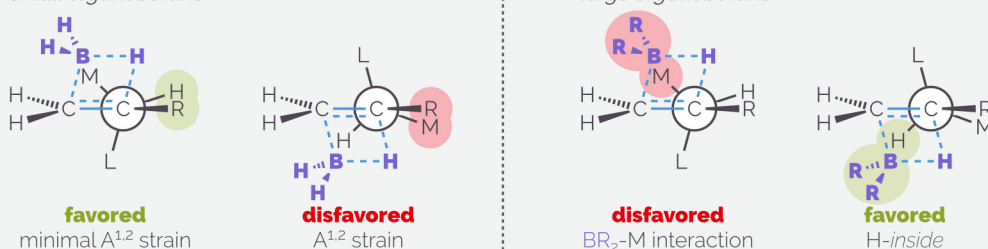
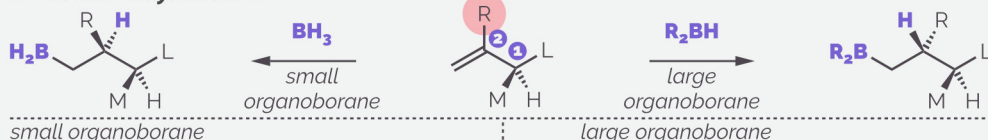


2B. Substrate control: acyclic reactants

$A^{1,3}$ strain - allylic strain



$A^{1,2}$ strain - allylic strain



ipc_2BH - good for cis-alkenes & 1,1-disubstituted alkenes

