H_2 Purification through Sequential Hydrogenation/Dehydrogenation of *N*-Heterocycles Using Triarylborane Catalysts

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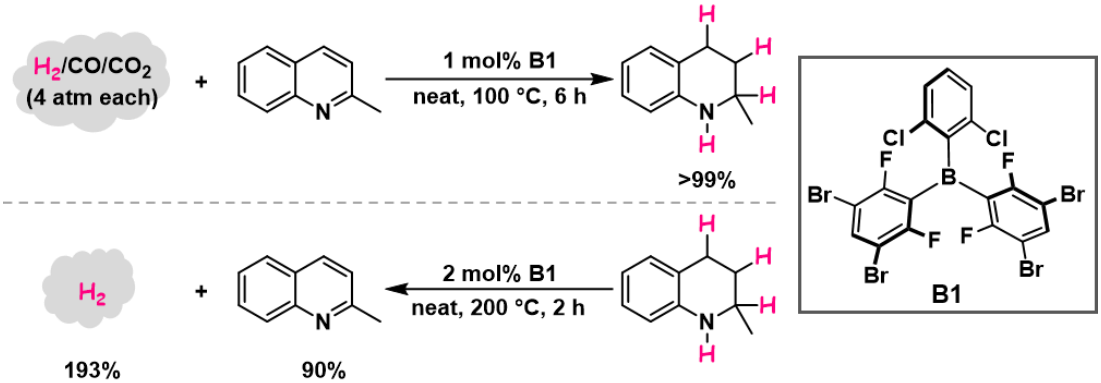
Molecular hydrogen (H_2) has been hailed as one of the most important energy carriers of the future, based on its high gravimetric energy density and the low environmental impact of its combustion product.[1] Most of H_2 in industrial use is currently produced from a variety of hydrocarbon sources including biomass through the in-depth purification of crude H_2, which is a gaseous mixture of H_2, CO, CO_2, and other components. Processes for the removal of such contaminants prior to H_2 storage are of importance to prevent the deactivation of metal-based catalysts used in fuel cells and the chemical industry; however, bypassing these purification processes is desirable, given their energy consumption and environmental impact, which ultimately increases the cost of the produced H_2. Here, we developed triarylboranes for the catalytic hydrogenation of *N*-heteroaromatic compounds in the co-presence of substantial amounts of CO, CO_2, CH_4, and H_2O, which is commensurate to a simultaneous separation and storage of H_2 (Scheme 1).[2]

We found that hydrogenation of 2-methylquinoline proceeded in the presence of a catalytic amount of **B1** and a gaseous mixture of H_2/CO/CO_2. Moreover, the **B1**-catalyzed dehydrogenation from 2-methyltetrahydroquinoline also proceeded.



Scheme 1. Catalytic hydrogenation/dehydrogenation of *N*-heterocycles.

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