

# Boosting selective hydrogenation through hydrogen spillover on supported-metal catalysts at room temperature

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## Abstract

Highly efficient hydrogenation of unsaturated substrates with strong absorption on metals at low temperatures is a long-term pursuit. However, due to the scaling relationship of high binding energies on metals, the poor activity and/or selectivity are frequently observed. Herein, we described a strategy of hydrogen spillover to break this scaling relationship to enable highly performed hydrogenation at low temperatures by constructing the dual-active site in supported-metal catalysts. Hydrogen and reactants are selectively activated on metal and the second active sites on support, respectively. Hydrogenation sequentially occurs on the second active sites via hydrogen spillover from metal to support. Easy desorption of surface-bounded products substantially re-generates the active sites. Guided by this design, for cinnamaldehyde hydrogenation, PtCo alloys (for H<sub>2</sub> dissociation) supported on hydroxyl-abundant CoBOx (for aldehyde activation) delivered a high turnover frequency of 2479 h<sup>-1</sup> (two orders of magnitude over PtCo/C) and 94.5% selectivity of cinnamyl alcohol at room temperature.

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