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Hydrogen-Induced Formation of Surface Acid Sites on Pt/Al$(PO_3)_3$ Enables Remarkably Efficient Hydrogenolysis of C–O Bonds in Alcohols and Ethers

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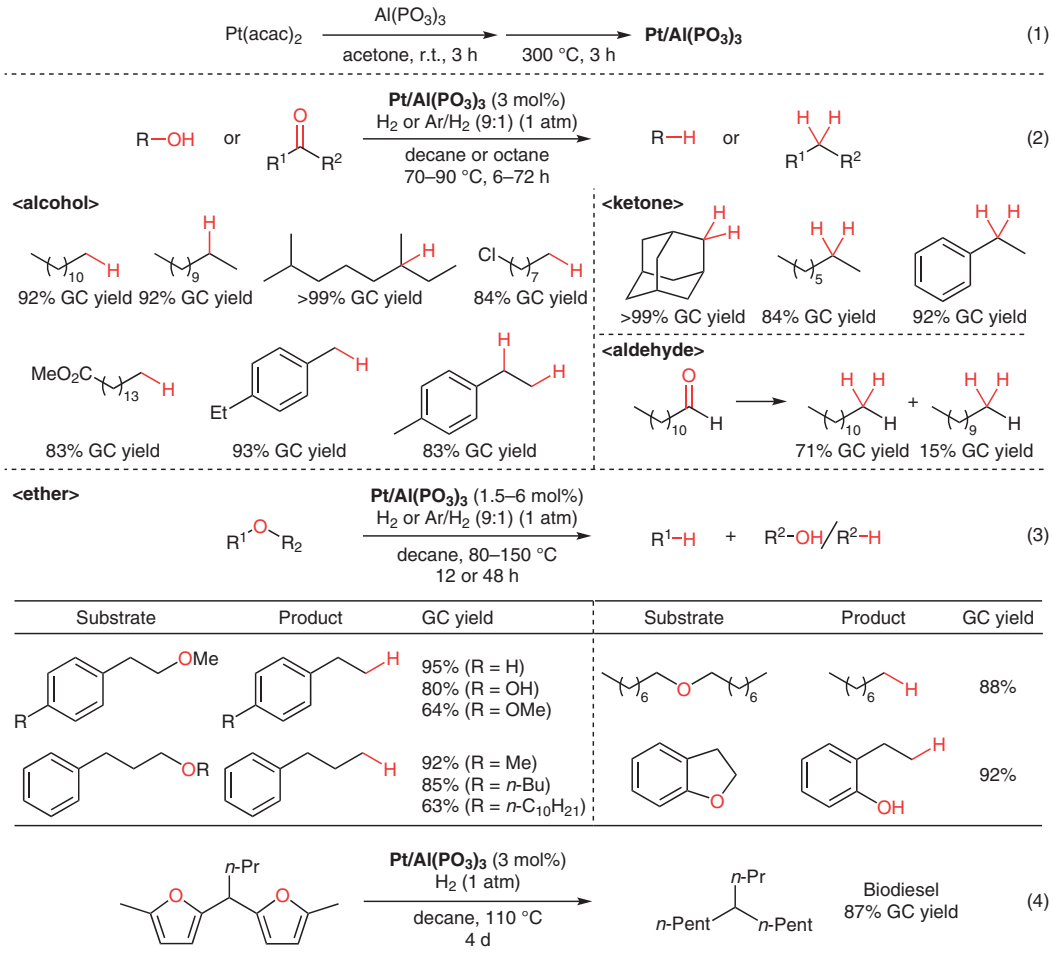
Hydrogenolysis of C–O Bonds in Alcohols, Carbonyls, and Ethers Using Pt NPs Supported on $Al(PO_3)_3$



Significance: Platinum nanoparticles supported on $Al(PO_3)_3$ (**Pt/Al(PO$_3$)$_3$**), prepared according to equation 1, catalyzed the hydrogenolysis of C–O bonds in alcohols and carbonyls under 1 atm H_2 or Ar/H_2 (9:1) atmosphere to afford the corresponding hydrocarbons in up to >99% yield (eq. 2). **Pt/Al(PO$_3$)$_3$** also promoted the hydrogenolysis of ethers under similar conditions to afford the corresponding hydrocarbons and alcohols in up to 95% yield (eq. 3).

Comment: The exhaustive hydrogenation of a biomass derived furanic compound took place at 110 °C with **Pt/Al(PO$_3$)$_3$** to give 6-propylundecane, a green fuel, in 87% GC yield (eq. 4). In the hydrogenolysis of 4-ethylbenzyl alcohol, the catalyst was recovered and reused four times without significant loss of its catalytic activity. Mechanistic studies suggested that Brønsted acid sites on the catalyst surface is essential to activate the C–O bond.

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Category

Polymer-Supported Synthesis

Key words

platinum catalysis
Brønsted acid
hydrogenolysis
C–O bond cleavage
alcohols
ketones
aldehydes
ethers

Synfact of the Month