Reduction of Nitriles, Aldehydes, and Ketones with Tetrahydroxydiborn Catalyzed by an Amphiphilic Resin-Supported Nanopalladium Catalyst

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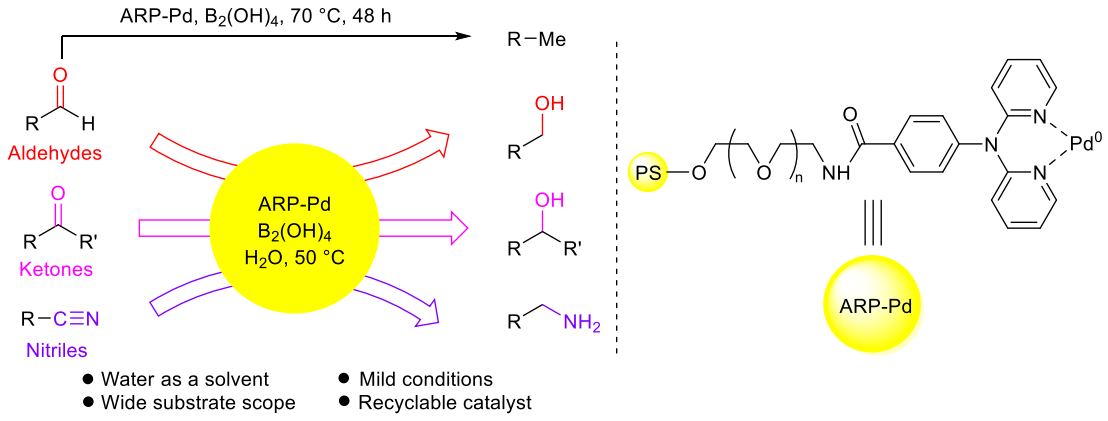
In the past few decades, tetrahydroxydiboron ($B_2(OH)_4$) has received attention as a versatile reductant. Thus, it has been reported that the combination of transition-metal catalyst and $B_2(OH)_4$ reduces various organic compounds such as alkenes, alkynes,[1] aryl halides,[2] azaarenes, and nitroarenes.[3] Herein, we report a novel reduction of aldehydes, ketones, and nitriles by $B_2(OH)_4$ with a polymer-supported palladium catalyst in water.

Amphiphilic polystyrene-poly(ethylene glycol) (PS-PEG) resin-supported palladium nanoparticles (ARP-Pd) were prepared by reduction of a PS-PEG resin-supported palladium(II) complex.[4] Reduction of aldehydes and ketones with $B_2(OH)_4$ (3 equiv) was carried out in water at 50 °C for 10 min in the presence of ARP-Pd (7.5 mol%) to give the corresponding alcohols in ≤91% yield. The reduction of nitriles also proceeds with ARP-Pd (0.1-5.5 mol%), $B_2(OH)_4$ (3 equiv), and HCl (1.2 equiv) to afford the corresponding amines in up to 86% yield. Furthermore, the exhaustive reduction of aldehydes took place with $B_2(OH)_4$ and ARP-Pd at 70 °C for 48 h to give the corresponding alkyl products.



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