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Selective Transfer Semihydrogenation of Alkynes with H_2O (D_2O) as the H (D) Source over a Pd–P Cathode
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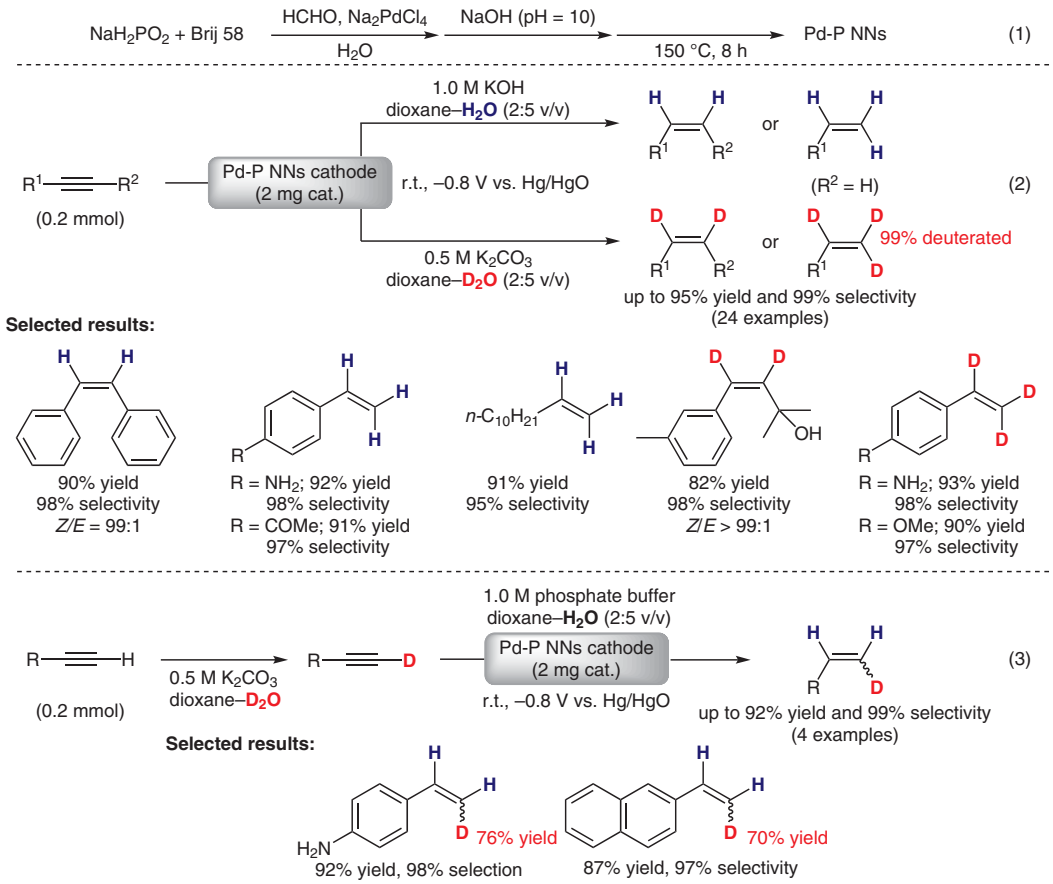
Selective Electrocatalytic Semihydrogenation of Alkynes by Water on a Pd–P Nanoparticle Network Cathode



Significance: A Pd–P alloy nanoparticle network (Pd–P NN), prepared according to Equation 1, promoted the selective electrocatalytic semihydrogenation of alkynes with H_2O in aqueous 1,4-dioxane with 1.0 M KOH as an electrolyte to afford the corresponding alkenes in up to 95% yield and 99% selectivity. When the reaction was performed in 1,4-dioxane–D_2O, the corresponding di- and trideuterated alkenes were obtained with 99% deuterium incorporation (Eq. 2). Monodeuterated alkenes were obtained by treatment of the alkynes with 0.5 M K_2CO_3 in 1,4-dioxane–D_2O, followed by the electrocatalytic semihydrogenation in aqueous 1,4-dioxane containing a phosphate buffer (Eq. 3).

Comment: The Pd–P NN was characterized by means of SEM, TEM, EDX, XRD, XPS analyses. In the electrocatalytic semihydrogenation of 4-ethynylaniline, the catalyst was reused five times without significant loss of activity. The electrocatalytic semideuteration of 4-ethynylanisole was conducted on a gram scale to give 1.0 g of 1-(ethenyl-d_3)-4-methoxybenzene in 90% yield with 99% selectivity and 99% deuterium incorporation.

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Category
Polymer-Supported Synthesis

Key words
electrocatalysis
semihydrogenation
alkynes
alkenes
palladium–phosphorus alloy
deuteration

Synfact of the Month