

Selective Electrocatalytic Semihydrogenation of Alkynes by Water on a Pd–P Nanoparticle Network Cathode

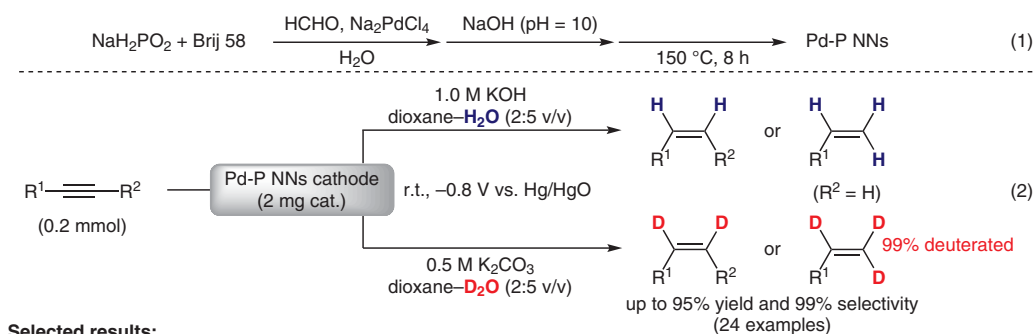
Category

Polymer-Supported Synthesis

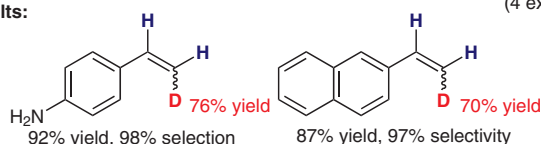
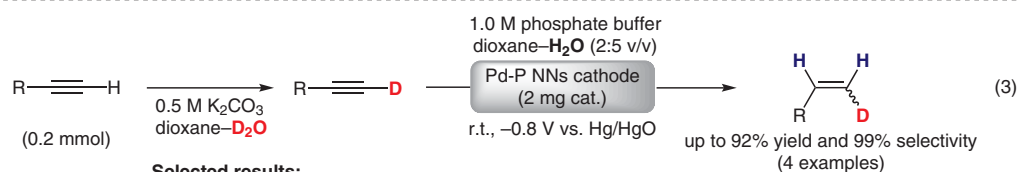
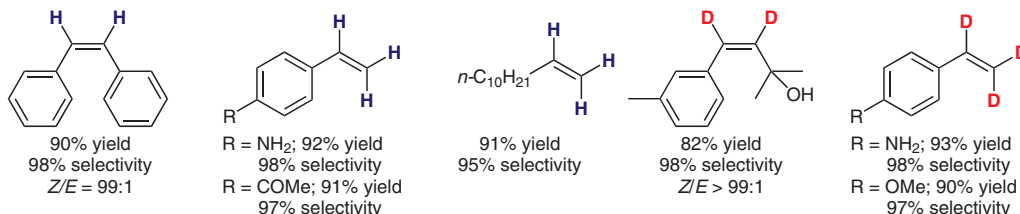
Key words

electrocatalysis
 semihydrogenation
 alkynes
 alkenes
 palladium–phosphorus alloy
 deuteration

Synfact
 of the Month



Selected results:



Significance: A Pd–P alloy nanoparticle network (Pd–P NN), prepared according to Equation 1, promoted the selective electrocatalytic semihydrogenation of alkynes with H₂O 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–D₂O, 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 K₂CO₃ in 1,4-dioxane–D₂O, 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.