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Encapsulating Palladium Nanoparticles inside Mesoporous MFI Zeolite Nanocrystals for Shape-Selective Catalysis
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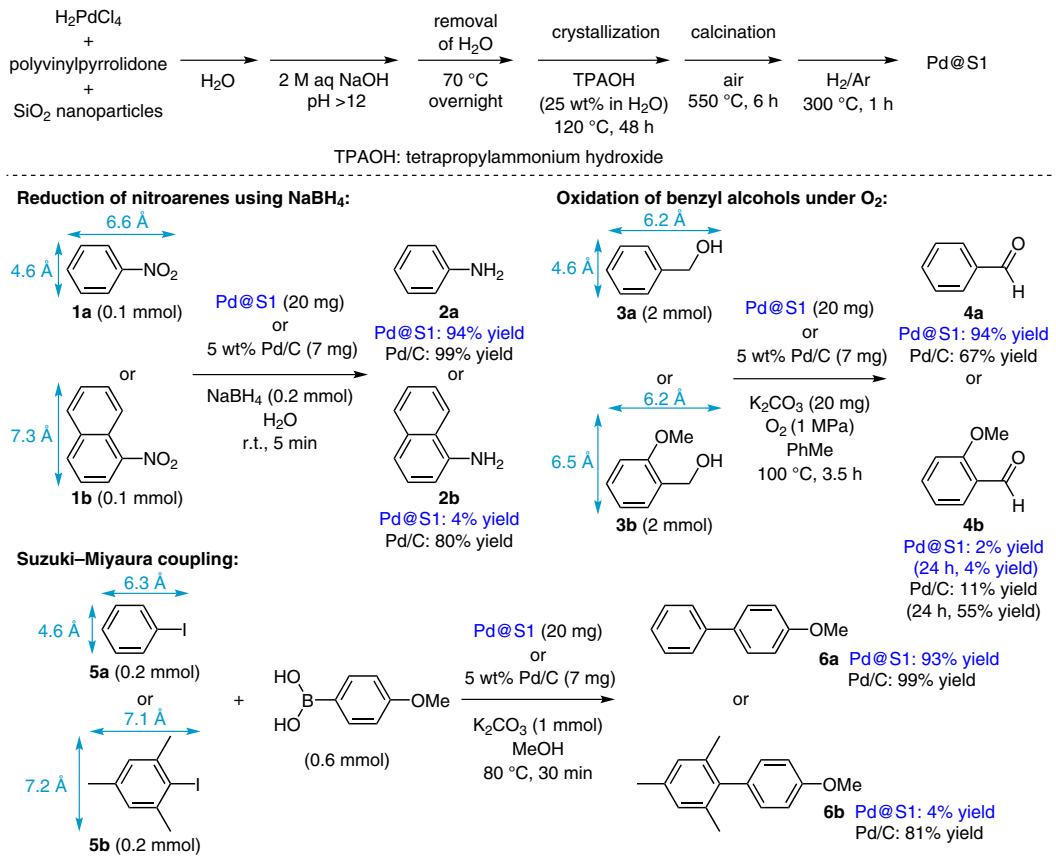
Shape-Selective Mesoporous Silicalite-Encapsulated Palladium Catalyst



Significance: Palladium nanoparticles encapsulated in mesoporous silicalite-1 (Pd@S1; pore size 5.3 × 5.6 Å, 1.7 wt% Pd) were prepared for use as a shape-selective catalyst. Reduction of nitrobenzene (**1a**) by $NaBH_4$, oxidation of benzyl alcohol (**3a**) under O_2, and the Suzuki–Miyaura coupling of iodobenzene (**5a**) with 4-methoxyphenylboronic acid proceeded in the presence of Pd@S1 to give the corresponding products **2a**, **4a**, and **6a** in 93–94% yield. Under similar conditions, the reactions of substrates with larger molecular size (**1b**, **3b**, and **5b**) gave the corresponding products in less than 4% yield.

Comment: The selectivity of the catalysis was evaluated by using Pd/C as catalyst as a control instead of Pd@S1 under similar conditions. Reduction of **1a**,**b**, the oxidation of **3a**,**b**, and the Suzuki–Miyaura coupling of **5a**,**b** with 4-methoxyphenylboronic acid proceeded in the presence of Pd/C to give the corresponding products **2a**,**b**, **4a**,**b**, and **6a**,**b** in 55–99% yield. In the coupling reaction of **5a** with 4-methoxyphenylboronic acid, Pd@S1 was reused fourteen times without significant loss of its catalytic activity.

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Category

Polymer-Supported Synthesis

Key words

palladium catalysis
nanoparticles
zeolite catalysis
shape-selective catalysis
oxidation
hydrogenation