

Double-doped Pd/C_{N-B} nano-architectures for hydrogen evolution and hydrogenation reaction in water

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Streszczenie

Carbon materials have shown great potential as catalyst supports. Rationally designing optimal precursors containing carbon, other heteroatoms, and metal precursors is crucial for the receipt of sophisticated materials for catalysis. In this regard, structurally and chemically defined metal–organic frameworks (MOFs) simultaneously contain key components of novel future catalysts and can be expected to be one of the most promising and versatile platforms for fabricating derived carbonaceous materials. Therefore, in this work, the thermal transformation of a unique Pd-MOF material is first proposed. The strategy also involved introducing tetrahydroxydiboron (THDB) as a B source for [Pd(2-pymo)₂]_n by physical grinding. During the carbonization process at 700 °C, the dual N–B doped carbon composite with small Pd nanoparticles (~4 nm) was formed. The hydrogen evolution reaction and the hydrogenation of phenylacetylene were selected to explore the catalytic performance of **Pd/C_{N-B}**. The TOFs of 56.6 mol H₂ mol cat⁻¹ min⁻¹ in NH₃BH₃ hydrolysis and 14.3 mol H₂ mol cat⁻¹ min⁻¹ in B₂(OH)₄ hydrolysis were reached. In the semihydrogenation of phenylacetylene, the **Pd/C_{N-B}** catalyst performs the highest conversion, 94%, with 97% selectivity of styrene at 70 °C. The synthetic approach demonstrated here can be extended in the future to prepare different carbon materials with other heteroatoms to improve catalytic performance.

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