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Monodisperse Hallow Sandwich MOF for the Catalytic Oxidation of Benzene at Room Temperature

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Abstract : Phenol is one of the most vital chemical in industry. Nowadays, phenol production is based upon the three-step cumene process, which involves a hazardous cumene hydroperoxide intermediate and produces nearly equimolar amounts of acetone as a coproduct. An attractive route in phenol production is the direct one-step selective hydroxylation of benzene using eco-friendly oxidants such as O2, N2O, and H2O2. In particular, the direct hydroxylation of benzene to form phenol with O2 has recently attracted extensive research attention because this process is green clean and eco-friendly. However, most of the catalytic systems involving O2 have a low rate of hydroxylation because the direct introduction of hydroxyl functionality into benzene is challenging. Almost all the developed catalytic systems require an elevated temperature and suffer from low conversion because of the notoriously low reactivity of aromatic C–H bonds. Moreover, increased reactivity of phenol relative to benzene makes the selective oxidation of benzene to phenol very difficult, especially under heating conditions. Hollow spheres, a very fascinating class of materials with good permeation and low density, highly monodisperse MOF hollow sandwich spheres have been rationally synthesized using monodisperse polystyrene (PS) nanoparticles as templates through a versatile step-by-step self-assembly strategy. So, our findings could pave the way toward highly efficient nonprecious catalysts for low-temperature oxidation reactions in heterogeneous catalysis. Because it is easy post-reaction separation, its cheap, green and recyclable.

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