Title:	3D Porous Polymeric-Foam-Supported Pd Nanocrystal as a Highly Efficient and Recyclable Catalyst for Organic Transformations
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Abstract:	The efficient recovery of noble metal nanocrystals used in heterogeneous organic transformations has remained a significant challenge, hindering their use in industry. Herein, highly catalytic Pd nanoparticles (NPs) were first prepared having a yield of >98% by a novel hydrothermal method using PVP as the reducing cum stabilizing agent that exhibited excellent turnover frequencies of ∼38,000 h–1 for Suzuki–Miyaura cross-coupling and ∼1200 h–1 for catalytic reduction of nitroarene compounds in a benign aqueous reaction medium. The Pd NPs were more efficient for cross-coupling of aryl compounds with electron-donating substituents than with electron-donating ones. Further, to improve their recyclability, a strategy was developed to embed these Pd NPs on mechanically robust polyurethane foam (PUF) for the first time and a “dip-catalyst” (Pd-PUF) containing 3D interconnected 100–500 μm pores was constructed. The PUF was chosen as the support with an expectation to reduce the fabrication cost of the “dip-catalyst” as the production of PUF is already commercialized. Pd-PUF could be easily separated from the reaction aliquot and reused without any loss of activity because the leaching of Pd NPs was found to be negligible in the various reaction mixtures. We show that the Pd-PUF could be reused for over 50 catalytic cycles maintaining a similar activity. We further demonstrate a scale-up reaction with a single-reaction 1.5 g yield for the Suzuki–Miyaura cross-coupling reaction.
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