Title:	Investigations on solvent effects during palladium nanoparticle synthesis: Influence on the catalytic efficiencies for 4-Nitrophenol reduction and Suzuki-Miyaura cross coupling
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Abstract:	Understanding thermodynamic and kinetic behavior of metal nanoparticles during the course of synthesis will be highly important to design the material with desirable catalytic activity. Among all the reaction parameters, solvents can play a significant role in the synthesis of metal nanostructures. Whilst a lot of advancement has been done in the field of size and shape selective catalysis of nanomaterials, the effect of solvent being used for synthesis is less explored upon. Being the medium of reaction, solvents can influence the sizes and properties of nanomaterials thereby controlling the reaction dynamics and kinetics. In order to synthesize efficient catalysts with good catalytic performances for their promotion in various commercial applications, it is essential to fully understand the influence of solvents on nanoparticle formation. In this scenario, the focus of our work is to investigate the effect of solvent on the morphology of the Pd NP catalysts, as well as to compare their catalytic activity towards various organic transformation reactions. We employed different solvents including water, ethylene glycol, DMF, ethanol for synthesis of Pd nanoparticles using different methods to investigate the change in catalytic performance of as-synthesized catalysts for 4-Nitrophenol reduction as well Suzuki-miyaura coupling reactions. The prepared catalysts were characterized by SEM and TEM. UV-Vis spectroscopy and 1 H-NMR were used to identify the reaction products. Catalytic activities of as- synthesized Pd NPs in different solvents was compared for reduction of 4-Nitrophenol to 4- Aminophenol using sodium borohydride as reducing agent. All catalysts showed significant difference in catalytic activity with DMF having the highest rate constant (0.0385 s -1) followed by ethylene glycol and water. To widen the scope of as synthesized catalysts, a few nitro aromatic compounds were then subjected to reduction to their corresponding products under similar reaction conditions. The as-synthesized solvent based catalysts were also employed in Suzuki-Miyaura coupling reaction with 4-iodoanisole and Phenylboronic acid in aqueous medium. It is expected that this research may be of significance to synthesize Pd nanostructures with desirable catalytic efficiency in an appropriate solvent to implement them for various applications.
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