

## ABSTRACT:

Size and shape selective synthesis of noble metal nanoparticles plays a pivotal role towards the improvement of kinetics of various organic and inorganic transformations. However, the yield of the monodisperse nanostructure synthesized using various procedure achieved so far is not up to mark 1 . The main aim of this work is to synthesize monodisperse Pd NCs in high yield. As synthesized Pd NCs were investigated for catalytic reduction of 4-Nitrophenol and Suzuki-Miyaura coupling reactions as model systems. High catalytic efficiency of Pd NCs due to the presence of {100} facets, which have low activation energy, which in turn favors dissociative chemisorption of substrates. The reason for choosing aforementioned model systems is due to the ease in handling them and due to their impact in solving some serious environmental as well as industrial concerns. With the help of solvothermal synthesis, we have generated high yield of monodisperse Pd NCs below 10 nm . 4-Nitrophenol reduction followed Pseudo first order reaction with a rate constant of  $3.129 \text{ min}^{-1}$  , which is far better than many catalysts that have been reported so far. We further verified the catalytic activity using other aromatic nitro compounds as well. Along with these, we have highlighted the remarkable recyclability of our catalyst using cycles of 4-Nitrophenol reduction reactions. From our series of reactions, we discovered that Pd NCs can catalyze Suzuki- Miyaura coupling reaction at room temperature in short time period providing high yield of cross coupled product without any side reactions. Our catalyst shows superior catalytic activity in terms of efficiency and recyclability, which shows green light for its diverse catalytic applications in near future.