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Synthesis and characterization of Gum Arabic microgels embedding metal based nanoparticles for catalytic reduction of 4-nitrophenol at ambient conditions

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The work presented here describes the successful synthesis and characterization of Gum Arabic (GA) microgel for *in situ* metal nanoparticles preparation for further use in the catalytic reduction of 4-nitrophenol (4-NP) to 4-Nitroaniline (4-NA). A reverse micellization method was owned to prepare GA based spherical microgels with a high yield of up to 79 % in 5-50 μm size range via successful crosslinking by divinyl sulfone (DVS) in gasoline medium. The as-synthesized microgels were used as a template for *in situ* fabrication of nickel (Ni) and copper (Cu) nanoparticles (NPs) using their corresponding salts as metal ion source and $NaBH_4$ as reducing agent. The successful synthesis of the prepared microgels thereafter *in situ* fabrication of nanoparticles was confirmed from Fourier Transform Infrared (FTIR) spectroscopy, Differential Scanning Calorimetry (DSC), X-ray diffraction characterization, Thermal gravimetric analysis (TGA), Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM). The Ni and Cu NPs loaded microgels were known as GA-Ni and GA-Cu microgels with Nickle and Copper NPs respectively. Further, the catalytic reduction characteristics of the prepared GA-Ni and GA-Cu composite microgels towards 4-NP were evaluated. Interestingly, the hybrid microgel show enhanced catalytic activity for the conversion of 4-NP to 4-NA which follows pseudo-first order kinetic rate law as well. A time delay of 8-10 min for all different amounts was observed for this catalytic reduction at room temperature 25°C; whereas the reduction interval was reduced to 6 min when of 0.05 g GA-Ni microgels were used.