# Facile synthesis of porous anionic hydrogel embedded with nickel nanoparticles and evaluation of its catalytic performance for the rapid reduction of 4-nitrophenol

Anionic hydrogel was prepared by free radical copolymerization of acrylamide and acrylic acid. The anionic groups acted as adsorption sites to load Ni(II) ions and the subsequent reduction of loaded Ni(II) ions into nanoparticles enabled the prepared hydrogels to act template for the preparation of nanostructured Ni particles. The characteristics of the prepared hydrogel and hydrogel–nickel nanoparticle composite were studied with Fourier transform infrared spectroscopy, transmission electron microscopy, thermal gravimetric analysis, X-ray photoelectron spectroscopy and X-ray diffraction technique. Swelling behaviour of hydrogel in aqueous medium was analysed by gravimetric analysis. Catalytic performance of the prepared poly(acrylamide-co-acrylic acid)–nickel nanoparticle hydrogel composite was investigated in the reduction of 4-nitrophenol (4-NP). Effects of temperature and catalyst dose on the reduction rate were also studied. Activation energy (Ea) for the reduction of 4-NP was found to be 43.46 kJ/mol. A maximum reduction rate of 0.40 min−1 was observed at room temperature.