



## Cu and Co nanoparticle composites based on starch poly(acrylic acid) hydrogel: reusable catalysts for catalytic reduction of nitrophenol

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### ABSTRACT

Starch poly(acrylic acid) (St-p(AA)) hydrogel was synthesized by radical polymerization in solution of starch with acrylic acid as monomer, *N,N'*-methylenebisacrylamide as the cross-linking agent and potassium persulfate as the initiator. St-p(AA) was used as a reactor for in situ synthesis of copper and cobalt nanoparticles. St-p(AA)-Cu and St-p(AA)-Co nanocomposites were characterized by Fourier transform infrared, scanning electron microscopy, transmission electron microscopy, thermal gravimetric analysis and atomic absorption spectroscopy. Catalytic performances of the prepared starch-p(AA)-M (M: Cu, Co) hydrogel composites were investigated by using them as catalyst in the reduction of 4-nitrophenol (4-NP) to 4-aminophenol. The effects of several parameters on the reduction reaction as temperature, catalyst amount and the initial concentration of NaBH<sub>4</sub> were investigated. The activation energy, activation enthalpy and activation of entropy for the reaction were calculated as 36.32, 34.97 and -197.52 J mol<sup>-1</sup> K<sup>-1</sup>, respectively.

**Keywords:** Nanoparticle; Hydrogel; Starch; Acrylic acid; Nitrophenol

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