



Spectrometric Characterization of Iron Nanoparticles Preparation using Chelating Ligands

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Abstract: Recent research has shown that nanoscale iron particles are effective material for the transformation of wide array of common environmental contamination in water systems. Zero valent iron nanoparticles (nZVI) are typically prepared by reducing Fe (II) of Fe (III) in an aqueous phase using sodium borohydride. In order to prepare nZVI of desired stability, a variety of stabilizing agents, surfactants or capping agents are employed in synthesis steps. The objective of this work is to provide comparison and quality control of iron nanoparticles produced under different experimental conditions. Therefore, the synthesis of nZVI from aqueous solution of iron salts after addition of different chelating ligands such as EDTA, dipicolinic and citric acid was studied. The resulting nanomaterials were characterized by scanning electron microscopy (SEM) which showed that the dendritic structure of nZVI in nano scale was favored in EDTA experiment. Preparation of nZVI was also tested by addition of selected heavy metals. Concentrations of metals in remaining aqueous solution were determined by inductively coupled plasma optical emission spectrometry (ICP-OES). The metal removal efficiency of nanoparticles was calculated from the observed changes in concentration.

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Sažetak

Novija istraživanja pokazuju da su nanočestice željeza efikasan materijal za transformaciju različitih zagađivala u okolišu, a posebice u vodenim ekosustavima. Neutralne nanočestice željeza uobičajeno se pripravljaju redukcijom vodenih otopina soli željeza jakim redukcijskim sredstvom kao što je NaBH₄. U svrhu poboljšanja stabilnosti nastalih čestica, mogući su dodatci različitih stabilizirajućih agensa, surfaktanata ili maskirajućih sredstava. Cilj ovog rada je provesti usporedbu i kontrolu kvalitete nanočestica željeza sintetiziranih u različitim eksperimentalnim uvjetima. Stoga je sinteza provedena u vodenim otopinama uz dodatak EDTA, dipikolinske i limunske kiseline. Rezultirajući nanomaterijali karakterizirani su metodom SEM kojom je utvrđeno da je dendritička struktura čestica na nanoskali favorizirana u EDTA sustavu. Ispitana je priprava nanočestica uz dodatak odabranih teških metala. Koncentracije metala u otopinama analizirane su metodom ICP-OES. Efikasnost uklanjanja metala pomoću nanočestica željeza određena je iz razlike mjerenih koncentracija.