Session IV:
Chemistry (A)

Colloidal Copper Nanoparticles: Synthesis, Characterization and Catalytic Behavior

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ABSTRACT

Copper nanoparticles (CuNPs) were prepared by two methods, chemical reduction using ascorbic acid and radiation-induced process. The TEM images and UV-visible spectra indicated that the average size of Cu nanoparticles obtained by gamma radiolysis method was smaller than those prepared by chemical reduction method. The radiolytic method provides copper nanoparticles in fully reduced and highly pure state as a function of irradiation doses compared to chemical reduction method. X-ray diffraction analysis confirmed the face centered cubic structure of CuNPs .The catalytic activity of the as-prepared CuNPs was evaluated on the reduction of p-nitrophenol (p-NP) to the corresponding amine (p-aminophenol, p-AMP) by sodium borohydride ($NaBH_4$). The reaction was monitored by UV–VIS spectroscopy at 400 nm. The prepared CuNPs by gamma radiolysis method were found to exhibit higher activity than that of convential chemical reduction reaction.

Key words: *Copper nanoparticles, Gamma irradiation, Chemical reduction, p-nitrophenol reduction.*

Adsorption Behaviors of Co(II) and Eu(III) on Polyacrylamide/Multi-Walled Carbon Nanotubes Composites

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ABSTRACT

Five novel sorbents composed of different polymersnanocomposite based on functionlizedmulti-walled carbon nanotubes (f-MWCNTs) weresynthenized. Different polymerization techniques were applied, namely copolymerization of acrylamide (AAm) and acrylic acid (AA) monomers and template polymerization of AAm or AA monomers on polyacrylamide (PAAm) with multi-walled carbon nanotubes(MWCNTs) the polymerization process was carried out in the presence of N,N\-methylenebisacrylamide (NMBA) as crosslinker,and induced by γ-irradiation. These sorbents were studied with respect to their adsorption and separationbehaviors of Co(II) and Eu(III), as a representative of tervalent lanthanides. The sorbents were characterized by Fourier transform infrared spectra (FT-IR). The adsorption behavior of Co(II) and Eu(III) on these sorbents was studied under varying experimental condition. The radioactive isotopes ^{60}Co and $^{152+154}$Eu were used for tracing the corresponding elements. The adsorption was carried out from acidic solution, as well as from solution containing the complexing agent EDTA. Distribution coefficient K_{ds} forCo(II) and Eu(III) were determined in each case. The adsorption behaviors of Co(II) and Eu(III) were studied also on some of the corresponding polymers (CP). The obtained data were compared with those obtained from adsorption on the synthesized nanocomposites. The obtained K_d-values for adsorption on the nanocompositeswere much high than CP. Complete adsorption was achieved on some of the synthesized nanocomposites under definite conditions, suggesting the possibility of completeisolation of Co(II) and/or Eu(III) from large volume aqueous solutions. Besides, separation of Co(II) and Eu(III) from each other was found to be possible under certain conditions.

Development and application of carbon nanotubes reinforced hydroxyapatite composite in separation of Co(II) and Eu(III) ions from aqueous solutions

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ABSTRACT

Multi-walled carbon nanotubes / strontium hydroxyapatite (MWCNTs/SH) composite was synthesized, where CNTs were applied to improve the properties of HAP and increase the reinforcement of the composite. The composite MWCNTs/SH and its precursor Sr-HAP were successfully applied in removal of Co(II) and Eu(III) ions from aqueous solutions. Sorption of Co(II) and Eu(III) onto the synthesized sorbents was investigated as a function of contact time and pH. The synthesized sorbents highly removed the studied radionuclides from their aqueous solutions with necessary time of 6 h to reach equilibrium. The maximum sorption capacity of Co(II) was 33.31 mg g^{-1} for Sr-HAP and 48.93 mg g^{-1} for MWCNTs/SH at pH 4.5, while it was 115.74 and 127.11 mg g^{-1} for sorption of Eu(III) onto Sr-HAP and MWCNTs/SH at pH 2.5, respectively. Desorption of Co(II) and Eu(III) from loaded samples was studied using various eluents and maximum recovery was obtained using $FeCl_3$ and HCl solutions. Co(II) was completely separated from Eu(III) by ratio of 85.1 % using $Cd(NO_3)_2$ as an eluent in MWCNTs/SH packed column.

Key words: *Carbon nanotube; Hydroxyapatite; Co(II); Eu(III); Separation.*

Extraction of Radium Isotopes From some Coastal Seawater samples in Egypt, Method Validation

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ABSTRACT

A radiochemical separation of Ra isotopes was carried out to determine the activity levels of radium (^{226}Ra and ^{228}Ra) in seawater samples, as well as providing a base-line data on background radiation in the investigated locations. Seawater samples were collected from selected sites along the coasts. The water samples were analyzed for radium isotopes (Ra-226 & Ra-228) using alpha and liquid scintillation detectors. Development steps were applied to the radioanalysis procedure by using calcium phosphate co-precipitation and the addition of isopropanol. Quality assurance and method validation of the developed procedure was carried out to assure the results. The obtained results were within the uncertainty level ± 5%. Quality control steps were applied through the efficiency calibration of the detectors, the estimation of uncertainties, the use of blanks and the comparison with other laboratories. For comparison, selected samples were measured by gamma spectrometry using high purity germanium detector, after radiochemical separation of the isotopes with ion-exchange chromatography using a strong cation exchange resin, and the activity concentrations of ^{228}Ra were comparable with those analyzed by the LSC. The average activity concentrations of ^{226}Ra and ^{228}Rain the Mediterranean seawater samples were found to be 166.8 and 500.6 mBq/L respectively, while in the Red seawater samples were 13.0 and 176.7 mBq/L respectively. The maximum value of radium activity was found at Ras El Barr estuary, where the River Nile fresh water mixes with the coastal seawater. On the basis of the current results, we may conclude that the radium activities in the investigated seawater samples are well comparable to the corresponding reported values in literature.