Adsorption of Cr(VI) and As(V) ions by modified magnetic chitosan chelating resin

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Abstract

Cross-linked magnetic chitosan anthranilic acid glutaraldehyde Schiffs base (CAGS) was prepared for adsorption of both As(V) and Cr(VI) ions and their determination by ICP-OES. Prepared cross-linked magnetic CAGS was investigated by means of SEM, FTIR, wide angle X-ray diffraction (WAXRD) and TGA analysis. The adsorption properties of cross-linked magnetic CAGS resin toward both As(V) and Cr(VI) were evaluated. Various factors affecting the uptake behavior such as pH, temperature, contact time, initial concentration of metal ions, effect of other ions and desorption were studied. The equilibrium was achieved after about 110 min and 120 min for As(V) and Cr(VI), respectively at pH = 2. The adsorption kinetics followed the mechanism of the pseudo-second order equation for all systems studied, evidencing chemical sorption as the rate-limiting step of adsorption mechanism and not involving a mass transfer in solution. The equilibrium data were analyzed using the Langmuir, Freundlich, and Tempkin isotherm models. The best interpretation for the equilibrium data was given by Langmuir isotherm, and the maximum adsorption capacities were 58.48 and 62.42 mg/g for both Cr(VI) and As(V), respectively. Cross-linked magnetic CAGS displayed higher adsorption capacity for Cr(VI). The adsorption capacity of the metal ions increased with increasing temperature under optimum conditions in case of Cr(VI), but decreased in case of As(V). The metal ion-loaded cross-linked magnetic CAGS were regenerated with an efficiency of greater than 88% using 0.2 M sodium hydroxide (NaOH). (C) 2011 Elsevier B.V. All rights reserved.

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Modification of chloromethylated polystyrene with 2-mercabtobenzothiazole for application a new sorbent for preconcentration and determination of Ag+ from different matrices

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Abstract

Chloromethylated polystyrene polymer (CMSP) modified with 2-mercabtobenzothiazole (MBT) has been developed for the selective separation and/or preconcentration of silver. The modified polymer (CMS-MBT) was characterized by elemental analysis and IR spectra. Batch and column modes were applied. The newly designed polymer quantitatively sorbed Ag+ at pH 2 when the flow rate is 5 ml min(-1). The maximum sorption capacity was 0.493 mmol g(-1) while the preconcentration factor was 250 for Ag+. The detection limit was 8 ng ml(-1). The desorption was effective with 5 ml of 2 mol l(-1) HNO3 prior to detection using AAS. The modified polymer was highly ion-selective in nature even in the presence of large concentrations of electrolytes or organic media, with a preconcentrating ability for Ag+. The utility of the modified polymer to synthetic and drugs samples showed RSD values of <3% reflecting its accuracy and reproducibility. (C) 2009 Elsevier B.V. All rights reserved.

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Removal, preconcentration and determination of trace heavy metal ions in water samples by AAS via chemically modified silica gel N-(1-carboxy-6-hydroxy) benzylidenepropylamine ion exchanger

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Abstract

The use of chemically modified silica gel N-(1-carboxy-6-hydroxy) benzylidenepropylamine (SiG-CHBPA), ion exchanger for removal and preconcentration of Cr, Mn, Fe, Co, Ni, Cu, Zn, Cd and Pb in natural water samples collected from River Nile, Mediterranean Sea and other locations followed by their consecutive AAS determination was described. The effects on the percentage of recovered metal ions including mass change of ion exchanger, stirring time, pH of sample solutions and eluent concentration were studied. The distribution coefficient K(d). ml g(-1) and the percentage concentration of the studied metal ions on the ion exchanger at equilibrium, C(M,eqm) ,% (Recovery, %) were studied as a function of experimental parameters. The logarithmic values of the distribution coefficients. log K(d) are 3-6.3. The interfering effects of some foreign ions on the removal. preconcentration and determination of the investigated metal ions were described. The metal-chelates formed between the ion exchanger and the studied metal ions were characterized by IR (absorption and reflectance), UV spectrometry, potentiometric titration and thermal analysis (TG and DTG). The reliability of the present method was confirmed by the comparison with a standard solvent extraction method. The present method is simple and rapidly applicable for the determination of the studied metal ions, ng ml(-1) in different natural water samples. (C) 2009 Elsevier B.V. All rights reserved.

Source: DESALINATION Volume: 250 Issue: 1 Pages: 62-70 DOI: 10.1016/j.desal.2009.09.009 Published: JAN 1 2010

Author Keywords: Removal; Preconcentration; Determination Cr; Mn; Fe; Co; Ni; Cu; Zn; Cd; Pb; AAS; Natural water analysis; Silica gel ion exchanger

KeyWords Plus: ATOMIC-ABSORPTION SPECTROMETRY; SOLID-PHASE EXTRACTION; SELECTIVITY PROPERTIES; AMINE DERIVATIVES; SEPARATION; SORPTION; SURFACE; COPPER

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Publisher: ELSEVIER SCIENCE BV, PO BOX 211, 1000 AE AMSTERDAM, NETHERLANDS

Web of Science Categories: Engineering, Chemical; Water Resources

Research Areas: Engineering; Water Resources

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Author(s): Amara, Mourad; Kerdjoudj, Hacene

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Author(s): KENAWY, IMM; ELDEFRAWY, MM; KHALIL, MS; et al.

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Author(s): Mahmoud, ME; El-Essawi, MM; Kholeif, SA; et al.

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novel method for speciation of Cr(III) and Cr(VI) and individual determination using Duolite C20 modified with active hydrazone

Hassanien, MM (Hassanien, M. M.)[2]; Kenawy, IM (Kenawy, I. M.)[1];

El-Menshawy, AM (El-Menshawy, A. M.)[1]; Ei-Asmy, AA (Ei-Asmy, A. A.)[1]

Abstract

Trivalent and hexavalent chromium have been successfully separated and estimated front different solutions using 1-(3,4-dihydroxybenzaldehyde)-2-acetylpyridiniumchloride hydrazone (DAPCH) loaded on Duolite C20 in batch and column modes. ne obtained modified resin [DAPCH-Duolite C20] was identified by C, H and N analyses and infrared spectra. The presence of multi-active chelating sites gives the ability for DAPCH to bind more chromium, Cr(III) by forming stable complex and chromate by forming ion pair molecule [H(2)DAPCH-Duolite C20](2+)[Cr2O7](2-) (H(2)DAPCH-Duolite C20 is the protonated form in acidic medium). The extraction isotherms were measured at different pH. The pH was found to be the backbone for the separation procedure in which the Cr(VI) and Cr(III) ions are sorbed selectively from aqueous solution at pH 2 and 6. respectively. The sot-bed ions can be eluted using different concentrations of HCI. The saturation sorption capacity (41.6 and 20.05 mg g(-1)), the preconcentration factor (150 and 200) and the detection limit (13.3 and 10.0 ppb) were calculated for Cr(III) and (VI). The loaded resin can be regenerated for at least 50 cycles. The utility of the modified resin was tested in aqueous samples and shows R.S.D. value of <4% reflecting its accuracy and reproducibility. (C) 2008 Elsevier B.V. All rights reserved.

Source: JOURNAL OF HAZARDOUS MATERIALS Volume: 158   Issue: 1   Pages: 170-176   DOI: 10.1016/j.jhazmat.2008.01.057   Published: OCT 1 2008

Author Keywords: resin; hydrazone; speciation; chromium; sorption

KeyWords Plus: ATOMIC-ABSORPTION-SPECTROMETRY; SOLID-PHASE EXTRACTION; ONLINE PRECONCENTRATION; FORMALDEHYDE RESIN; NATURAL-WATERS; TOTAL CHROMIUM; WASTE-WATER; SEPARATION; SAMPLES; FAAS

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Web of Science Categories: Engineering, Environmental; Engineering, Civil; Environmental

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Research Areas: Engineering; Environmental Sciences

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Times Cited: 1 (from All Databases)

Synthesis, thermal and spectral. studies of first-row transition metal complexes with Girard-T reagent-based ligand

El-Ayaan, U (El-Ayaan, Usama)[1]; Kenawy, IM (Kenawy, I. M.)[1];

El-Reash, YG (Abu El-Reash, Y. G.)[1]

Abstract

The complexing behaviour of 1-acetyltrimethyl ammonium chloride-4-benzoyl thiosemicarbazide (H(2)GTBzIT) towards the following first-row transition metal ions namely, Cr(III), Mn(II), Co(II), Ni(II), Cu(II) and Zn(II) have been examined by elemental analysis, magnetic measurements, electronic, IR and H-1 NMR. The proton-ligand ionization constants were determined potentiometrically using Irving-Rossotti technique. The stability constants of complexes were also calculated and were found in agreement with the sequence of stability constants of Irving and Williams. Thermal properties and decomposition kinetics of all complexes are investigated. The interpretation, mathematical analysis and evaluation of kinetic parameters (E, A, Delta H, Delta S and Delta G) of all thermal decomposition stages have been evaluated using Coats-Redfern and Horowitz-Metzger equations. (c) 2007 Elsevier B.V. All rights reserved.

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Publisher: ELSEVIER SCIENCE BV, PO BOX 211, 1000 AE AMSTERDAM, NETHERLANDS

Web of Science Categories: Chemistry, Physical

Research Areas: Chemistry

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