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Efficient Adsorption of Heavy Metal Ions from Aqueous Media onto Chemically Modified Bio-sorbents and Bio- composite

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Abstract

Providing clean and affordable water to meet human needs is one of the great challenges of the 21st century. Egypt has reached a state where the quantity of water available is imposing limits on its national economic development. Water quality is adding additional stress with 4.5 million tons of untreated or partially treated industrial pollutants estimated to enter the water supply annually. There has been an increasing focus on the application of sustainable biomaterials as an alternative to chemical-based wastewater treatment; i.e., reducing environmental impact, and provide safe water in the developing world. Modified biomaterials have great potential in water purification. Chemically modified chitosan and cellulose, and cellulose-green algae composite have been prepared and their structures were characterized by various spectroscopic, morphological, thermal measurements, which indicate either modification or composite formation. Adsorption is considered to be a potential cost-effective method for the removal of heavy metal ions from aqueous media and by incorporating modified supports, the adsorption of Cd(II) and Cr(VI) ions was greatly enhanced when compared to adsorption with their free forms. The optimum experimental parameters for this process are discussed in this study, including the initial pH, amount of sorbent, contact time and metal ions concentration. The adsorption kinetics and isotherms were discussed. The desorption processes illustrate the regeneration ability of the sorbents without any significant loss of its initial properties throughout three adsorption–desorption cycles. Compared to commercially expensive sorbents, the non-toxic, biodegradable chitosan, cellulose and algae materials could prove to be an attractive, alternative material for the removal of heavy metal ions from wastewater.The amount of Cd(II) ions adsorbed onto sorbent was determined from both the intensity of Raman-active vibration and atomic absorption spectroscopy. The nature of adsorption of Cd(II) and Cr(VI) ions onto the studied sorbents have been investigated.

Biography

Inorganic Chemistry professor Mansoura University, Egypt; Visiting Prof. McGill, Canada; Ioannina Univ, Greece. She was awarded B Sc Excellent honor) and M Sc (Mansoura Univ) and Ph D (Imperial College, UK) and Academic Visitor Imperial College, IKY Fellow, JICA fellow. She has written chapters, invited for 35 lectures worldwide, 80 publications, member in editorial boards in 10 scientific journals, and advisor (40 MSc , PhD theses). She developed several aspects of O,O; N,O and N,S donors complexes with low cytotoxicity with research interest is on transition metal complexes biologically active (anticancer, antiosteoporosis), catalysis and environmental for removal of heavy metal ions by adsorption onto Modified Solid Supports (MSS). Her academic efforts have been recognized by Mansoura Univ PLATES (2013, 2017, 2018; best Teaching-1992), JICA (2000), Imperial College (1993, 2008), Who's is Who's in the world (2008), Al-Azhar Univ (2007, 2009, 2011), Africa Pharmacology (South Africa 2016).

Publications

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