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Implementation of gelatin as an eco-friendly natural polymeric biosorbent for efficient removal of Cd(II), Hg(II) and Pb(II)

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A method is described for implementation of gelatin as an eco-friendly natural polymeric derivative of proteins and peptides in biosorptive removal of Cd(II), Pb(II) and Hg(II) from natural water matrices. Gelatin biosorbent as a biodegradable, biocompatible, non-toxic, non-carcinogenic, non-immunogenic, inexpensive material was potentially examined for adsorption and removal of some toxic heavy metal in presence of various controlling experimental parameters. The efficient biosorption properties of gelatin was explored and confirmed via determination of the metal capacity values by using the batch equilibrium technique under the influence of various pH values, contact time, initial metal ion concentration, biosorbent dosage and other interfering species. The maximum metal biosorption capacity values of Cd(II) and Pb(II) were identified as 0.640, and 0.440 mmol g⁻¹, respectively in pH 6.0. Hg(II) was characterized to behave differently by producing the highest metal capacity value as 0.780 mmol g⁻¹ in pH 2.0 and 7.0. The biosorption equilibrium conditions were reached in 20-25 min by the three evaluated metal ions. The optimum gelatin dosage was characterized as 10.0±1.0 mg by all metal ions. The potential applications of gelatin biosorbent for removal of Cd(II), Pb(II) and Hg(II) from real samples were successfully accomplished by using multistage micro-column technique. The percentage values of Hg(II) extraction from tap water, wastewater and saving lamp wastewater were found to correspond to 100.0, 91.1 and 97.1%, respectively, while Cd(II) and Pb(II) ions produced the range of 92.4-96.5% and 90.7-95.0% from the two water samples.

Biography

Mohamed E Mahmoud has completed his PhD from Northeastern University, Mass, USA. He is currently working as a Full Professor in Alexandria University, Alexandria, Egypt. He served as a Visiting Professor in King Abdullaziz University, Jeddah, KSA, University of Malaya, Kuala Lumpur, Malaysia and Newport News University, Virginia, USA. He has published more than 70 papers in reputed journals and is serving as a reviewer for a board member of international journals in the fields of analytical chemistry, environmental chemistry and chemical engineering.

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