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Preparation of Selective Hazardous Metal Ion Adsorbents from Acrylic Monomer Grafted PET Films

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Heavy metal pollution has become one of the most severe environmental problems today. The well-known environmental destruction cases caused by heavy metals: Minamata disease (organic mercury poisoning), Itai-itai disease (cadmium poisoning) imposed stricter regulation on the treatment of metal contaminated waste water prior to its discharge to the environment. In the present study acrylic monomer grafted polyethylene terephthalate (PET) films were prepared and examined for selective adsorption of hazardous heavy metal. The ɣ-ray induced grafting of acrylamide (AAm) and acrylic acid (AAc) onto PET films were carried out separately. Grafting of AAm and AAc on PET films was characterized by FTIR and SEM. The grafted films were further modified through alkali hydrolysis to improve the metal adsorption capacity. The hydrolyzed AAm grafted PET films containing amide groups were used to study Hg(II) adsorption and the hydrolyzed AAc grafted PET films containing carboxylate groups were used to study Cu(II) adsorption.

The hydrolyzed AAm grafted PET films were investigated for selective Hg(II) adsorption from mixture of Hg(II) and Pb(II) and the absorbent film showed high selectivity for the adsorption of Hg(II) over Pb(II) throughout the entire pH range (2.2–5.6) studied. The hydrolyzed AAc grafted PET films were used to study the selective Cu(II) adsorption from mixture of Cu(II), Co(II) and Ni(II) and the adsorbent film showed high selectivity towards Cu(II) in presence of Cu(II), Co(II) and Ni(II) in the pH range 1.5 to 4.5. Isotherms of selective metal adsorption were analyzed by using Langmuir isotherm model and kinetics of selective metal adsorption were investigated using pseudo-first-order and pseudo-second-order kinetic models. Desorption and reuse of the adsorbent films was also studied. Thus present study indicated that the functional monomer grafted PET films can be effectively used for selective adsorption.

Country/Organization invited to participate

Bangladesh

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