Ufuk Yildiz, Trends in Green chem, 3:2
DOI: 10.21767/2471-9889-C1-001

Ufuk Yildiz

Kocaeli University, Turkey

Novel macroporous cryogels with enhanced adsorption capability for the removal of Cu(II) ions from aqueous phase: Modeling, kinetics and recovery studies

Novel macroporous cryogels based on jeffamine with various molecular weights were prepared via freeze-drying method and then functionalized by successful reductive amination to yield reduced cryogels. The reduced cryogels were characterized by FT-IR and SEM and then used as adsorbents for removal of Cu(II) ions from aqueous solution. Preliminary adsorption test revealed that reduced cryogels showed 5 times higher adsorption capacity than non-reduced cryogels. Maximum adsorption capacities for Cu(II) ion removal were determined as 55.00, 46.73, 34.10 mg/g depending on the molecular weight of jeffamine used, at pH 5.5, temperature 55°C, dosage 80 mg and initial concentration of 100 ppm. Adsorption capacity of the reduced cryogels increases with increasing the initial concentration, pH, contact time and temperature but decreased with increasing adsorbent dosage. ΔH^{o} values were calculated from the temperature dependence data and the obtained positive values indicated that the adsorption process was endothermic in nature. Performed recovery tests for the different cryogels resulted in a good response within the range of 56–70% recovery. The experimental adsorption data well fitted to Freundlich isotherm and pseudo-second-order kinetic model. The intra-particle diffusion and Boyd model confirmed that the adsorption process occurred via particle diffusion.

Biography

Ufuk Yildiz studied Chemistry at the Karadeniz Technical University and has done his PhD in 1998 supervised by Professor Baki Hazer. He joined at the Kocaeli University as an Assistant Professor in 1998. After his Post-doctoral work on miniemulsion and emulsion polymerization with Professor Markus Antonietti, Dr. Katharina Landfester and Dr. Klaus Tauer at Max Planck Institute of Colloids and Interfaces (Golm, Germany) he returned to Turkey and was promoted to an Associate Professor in the year 2004. He was a Visiting Scientist at the University of Liverpool, Department of Chemistry within the Centre for Materials Discovery working with Professor Andy Cooper and Dr. Jon Weaver (2008). He became a Full Professor in 2009. His research interests include macroinitiators, polymeric phthalocyanines, heavy metal ion adsorption, hydrogels and heterophase polymerization.

uyildiz@kocaeli.edu.tr

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