World Academy of Science, Engineering and Technology
International Journal of Chemical and Materials Engineering
Vol:12, No:09, 2018

Poly(Acrylamide-Co-Itaconic Acid) Nanocomposite Hydrogels and Its Use in the Removal of Lead in Aqueous Solution

Authors : Majid Farsadrouh Rashti, Alireza Mohammadinejad, Amir Shafiee Kisomi

Abstract : Lead (Pb^{2+}), a cation, is a prime constituent of the majority of the industrial effluents such as mining, smelting and coal combustion, Pb-based painting and Pb containing pipes in water supply systems, paper and pulp refineries, printing, paints and pigments, explosive manufacturing, storage batteries, alloy and steel industries. The maximum permissible limit of lead in the water used for drinking and domesticating purpose is 0.01 mg/L as advised by Bureau of Indian Standards, BIS. This becomes the acceptable 'safe' level of lead(II) ions in water beyond which, the water becomes unfit for human use and consumption, and is potential enough to lead health problems and epidemics leading to kidney failure, neuronal disorders, and reproductive infertility. Superabsorbent hydrogels are loosely crosslinked hydrophilic polymers that in contact with aqueous solution can easily water and swell to several times to their initial volume without dissolving in aqueous medium. Superabsorbents are kind of hydrogels capable to swell and absorb a large amount of water in their three-dimensional networks. While the shapes of hydrogels do not change extensively during swelling, because of tremendously swelling capacity of superabsorbent, their shape will broadly change.Because of their superb response to changing environmental conditions including temperature pH, and solvent composition, superabsorbents have been attracting in numerous industrial applications. For instance, water retention property and subsequently. Natural-based superabsorbent hydrogels have attracted much attention in medical pharmaceutical, baby diapers, agriculture, and horticulture because of their non-toxicity, biocompatibility, and biodegradability. Novel superabsorbent hydrogel nanocomposites were prepared by graft copolymerization of acrylamide and itaconic acid in the presence of nanoclay (laponite), using methylene bisacrylamide (MBA) and potassium persulfate, former as a crosslinking agent and the second as an initiator. The superabsorbent hydrogel nanocomposites structure was characterized by FTIR spectroscopy, SEM and TGA Spectroscopy adsorption of metal ions on poly (AAm-co-IA). The equilibrium swelling values of copolymer was determined by gravimetric method. During the adsorption of metal ions on polymer, residual metal ion concentration in the solution and the solution pH were measured. The effects of the clay content of the hydrogel on its metal ions uptake behavior were studied. The NC hydrogels may be considered as a good candidate for environmental applications to retain more water and to remove heavy metals.

Keywords : adsorption, hydrogel, nanocomposite, super adsorbent
Conference Title : ICNN 2018 : International Conference on Nanochemistry and Nanoengineering
Conference Location : Rome, Italy
Conference Dates : September 17-18, 2018