Evaluation of heavy metals removal by cross-linked (polyvinyl alcohol/chitosan/magnetic) nano fibrous membrane prepared by electro spinning technique

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ABSTRACT

In this study, chitosan/polyvinyl alcohol (PVA)/magnetic nano fibrous membrane was fabricated via electro spinning. First, magnetic nano particles with average size of 7.98 nm, were fabricated using co-precipitation method. Then, chitosan solution was blended with aqueous PVA solution in different weight ratios. The electro spun fibers were kept in a glass desiccator saturated with (50% aqueous solution) of glutaraldehyde vapor for 24 h. Morphological analysis of chitosan/PVA electro spun nano fibrous showed a defect-free nano fiber material with 50:50 weight ratio of chitosan/PVA. Subsequently, 1 wt.% of magnetic nano particles was added to 50:50 chitosan/PVA solution and then, fine bead free nano fibrous electro spun was fabricated. The resulting nano fiber was characterized with field emission scanning electron microscopy, energy dispersive X-ray spectroscopy, X-Ray diffraction, Fourier transform infrared spectroscopy, swelling test, and adsorption test. The resulting membrane was stable in distilled water, acidic, and basic media overnight. Moreover, the adsorption ability of nano fibrous membrane was studied over Cr^{6+}, Pb^{2+}, and Ni^{2+} ions. Kinetic parameters were estimated using the first-order and pseudo-second-order models. Kinetic study showed that adsorption rate was high. Therefore, chitosan/polyvinyl alcohol (PVA)/magnetic nano fibrous membrane can be a useful material for water treatment at moderate concentration of heavy metals.

Keywords: Chitosan; PVA; Magnetic nano particles; Electro spinning; Heavy metals adsorption

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