6th International Conference on Civil, Architectural & Environmental Sciences
6ICCAE
June 19, 2019 | Stockholm - Sweden

Removal of heavy metals in wastewater by using Zeolite nanoparticles

Parinaz Babaei *

Department of Chemical Engineering, Faculity of Engineering, Islamic Azad University, Tabriz Branch, Tabriz, Iran, pari.babaei20@yahoo.com

Abstract

In this study, the adsorption and the filtration processes were coupled by a zeolite nanoparticle impregnated polysulfone (PSf) membrane which was used to remove the lead and the nickel cations from synthetically prepared solutions. The results obtained from X-ray diffraction (XRD), scanning electron microscopy (SEM) and energy dispersive X-ray (EDX) analysis indicated that the synthesized zeolite nanoparticles, using the conventional hydrothermal method, produced a pure NaX with ultrafine and uniform particles. The performance of the hybrid membrane was determined under dynamic conditions. The results also revealed that the sorption capacity, as well as the water hydraulic permeability of the membranes, could both be improved by simply tuning the membrane fabricating conditions such as evaporation period of the casting film and NaX loading. The maximum sorption capacity of the hybrid membrane for the lead and nickel ions was measured as 682 and 122 mg/g respectively at the end of 60 min of filtration, under 1 bar of transmembrane pressure. The coupling process suggested that membrane architecture could be efficiently used for treating metal solutions with low concentrations and transmembrane pressures.

Key words: Adsorption, metal removal, Ultrafiltration, Zeolite nanoparticles

1. Introduction

The preservation of quality and adequate water resources to sustain the needs of modern society has become a major problem today, due to excessive increases in volumetric production of industrial effluents, as well as inadequate conventional wastewater treatments that do not meet the discharge limits proposed by the environmental and health organizations.

The conventional processes of removing heavy metals generally include chemical precipitation, ion-exchange and electrochemical deposition [1] which have many disadvantageous, such as high energy requirements especially when the contaminant concentrations range from 10 to 100 mg/L, excessive toxic sludge production which is required for further treatment and a lack of quality of the treated water within acceptable limits [2].