J Material Sci Eng 2017, 6:9 (Suppl)
DOI: 10.4172/2169-0022-C1-086

Removal of rare earth metal ions by functionalized electrospun polystyrene nanofiber from aqueous solution

Omoniyi K Pereao, Chris Bode-Aluko and **Leslie F Petrik**
University of the Western Cape, South Africa

Rare earth elements (REEs) are important in the transition to a green, low-carbon economy. Increased environmental exposure and water pollution from numerous REEs commercial products and rare earth metal mines has led to harmful effects to humans. Electrospinning has gained much consideration due to its versatility in spinning a wide variety of polymeric fibres. Electrospun polystyrene (PS) was modified with diglycolic anhydride (DGAA) and its application for the adsorption of Ce^{3+} and Nd^{3+} from aqueous solution in a batch mode was studied under optimum adsorption conditions; Ce^{3+} and Nd^{3+} concentration 100 mg/l, pH 3.5, adsorbent dosage 75 mg/10 mL at room temperature. The kinetic data were analyzed by pseudo-first-order and pseudo-second-order kinetic models. The Freundlich and Langmuir isotherm models were used to describe the equilibrium data. FTIR spectra of the PS nanofiber and modified nanofibre adsorbent (PS-DGAA) revealed that the PS-DGAA presented peaks for C=O (νC=O, 1732), peaks of (--C=O of --COOH), at 1223 and 1140 cm^{-1} which were assigned to carboxylate groups from functional groups expected from DGAA. More than 90% of the total adsorption of Ce^{3+} and Nd^{3+} metal ions was removed within 1 hour. The maximum efficiency of the adsorption of Ce^{3+} and Nd^{3+} was 90.51% and 91.42% respectively. The results showed that the PS-DGAA nanofibre adsorbent possessed extra high extraction capability within a relatively short time for the removal of rare earth metal ions. The adsorption equilibrium data for the metal solutions fitted the Langmuir model well.

pereaokola@gmail.com