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# Fabrication of PES/NaX nanocomposite nanofibrous adsorbent for the removal of $Cu^{2+}$, $Co^{2+}$ and $Fe^{2+}$ from aqueous solutions

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**ABSTRACT**

In this work, the potential of the prepared polyethersulfone (PES)/NaX nanocomposite nanofibrous adsorbents for the removal of $Cu^{2+}$, $Co^{2+}$ and $Fe^{2+}$ from aqueous solution were investigated. For this purpose, PES/polyacrylonitrile/polyvinylpyrrolidone/NaX (PES/NaX) nanocomposite nanofibers were prepared using the electrospinning process. The prepared nanocomposite nanofibers were characterized by scanning electron microscopy analysis. The effect of different parameters such as zeolite concentration, the dosage of adsorbent, pH, contact time, and the initial concentration of $Cu^{2+}$, $Co^{2+}$ and $Fe^{2+}$ ions as well as temperature on the efficiency of adsorption were studied in a batch system. The adsorption results showed that the affinity of PES/NaX nanocomposite nanofibrous adsorbent for the removal of metal ions was on the agenda $Cu^{2+} > Co^{2+} > Fe^{2+}$. The kinetic data of metal ions were analyzed by pseudo-first-order, pseudo-second-order and double-exponential kinetic models. Isotherm models namely Freundlich, Langmuir, Redlich–Peterson and Temkin were applied to explain the equilibrium data of metal ions. The maximum monolayer sorption capacities of $Cu^{2+}$, $Co^{2+}$ and $Fe^{2+}$ were estimated to be 783.3, 654.4 and 642 (mg/g) in an equilibrium time of 60 min and temperature of 45°C. Evaluation of thermodynamic parameters ($\Delta G°$, $\Delta H°$ and $\Delta S°$) indicated that the nature of metal ions sorption onto the PES/NaX nanocomposite nanofibrous adsorbent was feasible and endothermic. The reusability of the PES/NaX nanocomposite nanofibrous adsorbent was also evaluated after four adsorption–desorption cycles as well.

*Keywords:* PES/NaX; Nanocomposite; Nanofibers; Heavy metal; Adsorption

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