



3-(Aminopropyl)triethoxysilane modified CuO nanoparticles-mediated adsorbent for removal of methylene blue through polymer inclusion membranes transport: optimization of operational variables

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Received 27 May 2021; Accepted 22 September 2021

ABSTRACT

The current study presents the fabrication of 3-(aminopropyl)triethoxysilane (APTES) enhanced CuO nanoparticles integrated polymer inclusion membranes (PIMs) and their application in the removal of the textile dyes via transportation from one phase to another. The said membranes were fabricated with facile diffusion induced phase inversion technique and were characterized with Fourier transform infrared spectroscopy and scanning electron microscopy. Later the membranes were employed in the self-made detachable cell with two compartments of glass and a steel clamp. The cell allows the installation of the PIM between the glass compartments, which is used for the transportation of the dye (methylene blue) from the feed phase to the strip phase. Different parameters, which can affect the transportation of the dye such as the pH of the feed and the acceptor phase, stirring speed, time, percentage of the carrier in the membrane and the concentration of the dye were optimized. After optimization, 97% transportation efficiency was achieved. In the study, the comparative analysis between the transportation of the dye by CuO nanoparticles integrated membranes and the 3-(aminopropyl)triethoxysilane modified CuO nanoparticles integrated membranes have also been conducted. The results of the comparative permeation study showed better transportation of the dye with the 3-(aminopropyl)triethoxysilane modified CuO nanoparticles integrated membranes.

Keywords: Nanoparticles; Membrane separations; Dyes; Transport; Water treatment

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