Synthesis of nanocomposite membranes and their application in photocatalytic process for organic pollutions removal from groundwater, East Nile Delta, Egypt

Moustafa M. Abo El-Fadl*, Abdel Hameed M. El-Aassar, Amr A. Mohamed

Hydrogeochemistry Department, Desert Research Center, Cairo, Egypt, Tel./Fax: +202 26389069; email: mnaobelfadl@hotmail.com

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ABSTRACT

Novel sodium alginate (SA)/titanium dioxide (TiO$_2$) nanocomposite membranes were synthesized using dry casting method as a preparation technique with CaCl$_2$, BaCl$_2$, phosphoric acid, and glutaraldehyde (GA) were tested, as crosslinkers. It was found that GA was the best crosslinker because it gives the best mechanically stable hydrogels, which is not degradable in water. The chemical stability of synthesized membranes was studied at wide pH range from 3 to 13. Also, the characterizations were examined using FTIR spectroscopy, X-ray Diffraction, and Tapping Mode-Atomic Force Microscopy. The applicability of these synthesized membranes as photocatalyst was studied using textile azo-dye methyl orange (MO) as target pollutant. The effects of time, nanoparticles concentration, initial dye concentration, and pH on photocatalysis efficiency of the nanocomposite membranes were investigated through determination of photo-bleaching rate of MO. SA/TiO$_2$ nanocomposite showed enhanced photocatalytic degradability using optimum operation conditions and can be used in photocatalytic process for organic pollutions removal from groundwater collected from East Nile delta, Egypt.

Keywords: SA/TiO$_2$; Synthesis; Characterization; Photocatalysis; Organic pollution

*Corresponding author.


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