Utilization of self-synthesized ZnO nanoparticles in MPR for industrial dye wastewater treatment using NF and UF membrane

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\textbf{ABSTRACT}

This study attempted to use zinc oxide (ZnO) nanoparticles in membrane photocatalytic reactor (MPR) for industrial dye wastewater treatment. Performance comparison of nanofiltration (NF) and ultrafiltration (UF) in the MPR system were investigated to produce cleaner discharge and to retain the ZnO for reuse. From the results, the optimum operational condition of MPR occurred under pH 11 and 0.1 g L\textsuperscript{−1} of ZnO loading. NF membrane performance improved after the addition of ZnO nanoparticles in the wastewater; in terms of normalized flux reduction (65\%), colour removal (100\%), chemical oxygen demand (92\%), turbidity reduction (100\%) and total suspended solid rejection (100\%). In contrast, UF membrane showed worse performance, due to the permeation of dye molecules and nanosized ZnO across the UF membrane pores. Membrane characterizations of field emission scanning electron microscopy and energy dispersive X-ray results confirmed that the ZnO nanoparticles and NF membrane application has a great potential for improving MPR system in industrial wastewater treatment.

\textit{Keywords:} Zinc oxide nanoparticles; Membrane photocatalytic reactor; Nanofiltration; Ultrafiltration; Industrial dye wastewater

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