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Extraction of phenol from aqueous effluent using triglycerides in supported liquid membrane

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ABSTRACT

This research work focuses on the removal of phenol using a flat sheet supported liquid membrane impregnated with triglycerides (vegetable oils). The mass transfer of phenol was found to be dependent on various factors such as type of vegetable oil, support material, feed phase pH and concentration, stripping phase concentration and stirring speed. The phenol transport was found to be higher when PTFE membrane (pore size 0.45 μm) impregnated with coconut oil was used and mass transfer coefficient was found to be 3.50×10^{-6} m/s. The corresponding stirring speed, pH of feed solution, concentration of stripping (NaOH) solution were 350 rpm, 4.0 and 0.2 M, respectively. The 92.5% of phenol was extracted from feed phase to stripping phase in 20 h. The aqueous boundary layer thickness reduced with an increase in stirring speed up to a certain extent (350 rpm), beyond which, it resulted in turbulence leading to displacement of impregnated oil from membrane pores. Phenol can be transported through the membrane, when it is present in molecular or undissociated state in aqueous solution. Since the pKa value of phenol is 10, the phenol will be present in undissociated form when the pH of the feed solution was 4.0, which resulted in the highest membrane mass transfer coefficient. The extraction of phenol was found to be dependent on the composition of fatty acids (chain length and position of double bond) in triglyceride. It may be concluded that PTFE membrane impregnated with triglyceride from coconut can be successfully used for the extraction of phenol from aqueous feed.

Keywords: Phenol; Mass transfer; Supported liquid membrane; Vegetable oil

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