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Micellar enhanced ultrafiltration (MEUF) and activated carbon fibre (ACF) hybrid processes for nickel removal from an aqueous solution

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ABSTRACT

In the present study, nickel removal from an aqueous solution using micellar enhanced ultrafiltration at various operating parameters such as initial permeate flux, retentate pressure, initial nickel concentration, pH, molecular weight cut-off and molar ratio of nickel to sodium dodecyl sulphate (SDS) was investigated. The SDS surfactant removal from an aqueous solution using activated carbon fibre (ACF) was also monitored. The removal efficiency of nickel from an aqueous solution increased with an increase in the retentate pressure, initial permeate flux, pH and molar ratio of nickel to SDS, while the specific and relative fluxes declined. Considering the nickel removal efficiency and the permeate flux, initial permeate flux of 1.05 m^3/m^2/day, nickel to SDS molar ratio of 1:10 and operating retentate pressure of 1.4 bar were found to be the optimum operating parameters within the experimental condition for 0.5 mM or less initial nickel concentration. At the optimized experimental condition,the nickel removal efficiency was 98% and the corresponding permeate nickel concentration was less than 1 mg/L. Similarly, two ACF cartridge units in series have removed the SDS up to 85% and the adsorptive capacity of ACF for SDS was 170 mg/g. the Langmuir isotherm equation fitted better with the experimental results than the Freundlich isotherm equation.

Keywords: Micellar enhanced ultrafiltration (MEUF); Nickel; Sodium dodecyl sulphate (SDS); Activated carbon fibre (ACF)

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