

ION-EXCHANGE/ULTRAFILTRATION SYSTEM FOR SURFACTANTS REMOVAL FROM WATER SOLUTIONS

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In recent years considerable attention has been focused on the problems caused by laundry and cleaning chemicals and the environmental risks associated with their manufacture, use and disposal. The consumption of surfactants for both industrial and domestic purpose has resulted in worldwide production of approximately 17 million tonnes in 2000 (including soap), with expected future growth rates of 3% to 4% per year globally and of 1.5% to 2.0% in the EU. The high and varied polluting load of the detergent wastewater can cause significant environmental problems because detergent product and its core ingredients (surfactants) can be relatively toxic to aquatic life. In order to meet legislative requirements in discharging the wastewater to the environment the surfactant concentration has to be reduced.

Studies were performed to determine the effectiveness of hybrid process combining ion-exchange and ultrafiltration for surfactant separation from water solutions. During the experiments the influence of membrane cut-off, polymer material, type of ion-exchange resin, resin dose and contact time was evaluated. The results obtained for the hybrid process were also compared with the effectiveness of the single processes. i.e. ultrafiltration and ion-exchange.

It was found that the combination of ion-exchange and ultrafiltration was more effective in surfactant removal than ultrafiltration process alone. In the hybrid process because of the ion-exchange resin presence, the systematic increase in surfactant separation along with the filtration time was noticed. From among ion-exchange resin tested the most effective was magnetic ion-exchange one (MIEX[®]). For the smallest resin dose equal to 5 mL/L the reduction of anionic surfactants reached almost 100% for the hybrid process with 5 kDa polyethersulphone membrane and 5 kDa cellulose membrane. However ultrafiltration allowed to reduce surfactant concentration of 39% and 89% for 5 kDa cellulose membrane and 5 kDa polyethersulphone membrane, respectively.

Keywords: surfactant, detergent, ultrafiltration, membrane, ion-exchange, hybrid process