

Recovery of valuable salts from wastewater using membrane distillation-crystallization

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Abstract:

Osmotic membrane distillation-crystallization is proposed in this study to recover sodium carbonate, potassium nitrate and sodium sulphate from synthetic industrial wastewater solutions. The technical viability of the process is discussed in terms of transmembrane fluxes, mass transfer coefficients and crystals purity. The effect of concentrations of the feed and osmotic solution, flow rates and presence of impurities was determined as well. Two membrane contactors in series were also used in order to increase the membrane area and detect changes in performance, if any [1].

The experimental results showed that varying the concentration of the osmotic solution was the main parameter affecting the transmembrane flux. The concentration of the three salts in the feed had slight influence while no significant effect was observed when flow rates in both the feed and the osmotic side were varied. High purity crystals of $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$, $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ and KNO_3 was obtained (Figure 1). In addition, using two contactors in series did not produce any alteration in the process performance.

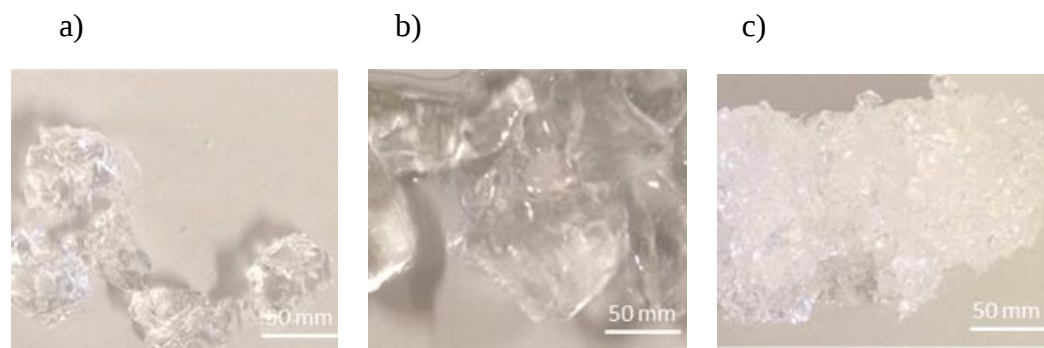


Figure 1. Crystals of a) $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$; b) $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$; and c) KNO_3

Keywords: Membrane crystallization, membrane distillation, waste streams, salts recovery

[1] I. Ruiz Salmón, K. Simon, C. Clérin, P. Luis, Salt recovery from wastewater using membrane distillation-crystallization, *Crystal Growth & Design*, submitted.

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