

Lithium Salt Production using Membrane Percrystallisation

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Abstract:

Lithium salts are critical ingredients in the manufacturing of rechargeable batteries required for electric vehicles. Lithium salts are generally recovered by chemical precipitation or evaporative crystallisation. A new approach to evaporative crystallisation is inorganic membrane percrystallisation. This is a form of process intensification where the solute is completely separated and the dry salt product is formed on the permeate side of the membrane. This process is also different from membrane crystallisation where crystals are formed on the retentate side of the membrane often leading to fouling and requiring solid-liquid separation and drying. In the ideal membrane percrystallisation operation, production can run continuously for extended periods with the salt being naturally ejected from the membrane surface. Inorganic membrane percrystallisation also offers an opportunity of unique particle shapes and sizes. Recently, a continuous membrane percrystallisation process employing carbon membranes were proposed which were relatively low cost to produce and exhibited chemical stability over a wide range of solution compositions. In this presentation, we report on membrane percrystallisation experiments showing that this technology can be utilised to attain lithium salts from 20 % w/w lithium acetate synthetic solution with a 33 L m⁻² h⁻¹ flux of the pure solvent and 8 kg m⁻² h⁻¹ flux of dry solute. Other lithium salts including lithium chloride and lithium sulfate are currently being tested. The lithium salt recovery will be compared with sodium chloride feed which is used as a baseline for comparison. The preliminary results suggest that the membrane percrystallisation process may be a valuable approach for the recovery of crystalline lithium salt from solutions.

Keywords : Carbon Membranes, Lithium, Percrystallisation, Salt