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# Comparative Study of Membrane Processes for Lithium Carbonate Production: Electrodialysis vs. Donnan dialysis

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In recent years, the demand for lithium has surged dramatically, primarily driven by the expansion of electromobility and the growing need for lithium batteries. Global projections indicate that by 2030, the demand for lithium batteries will be more than 11 times higher than in 2022. With limited access to primary lithium sources and lithium's designation as a critical metal in 2020, the recovery of lithium from secondary sources—such as spent batteries—has become increasingly important. Various technologies have been explored for this purpose, including ion exchange, electrodialysis, and Donnan dialysis, each presenting specific challenges that require optimization. Continued research and development are essential to enhance electrodialysis and other membrane processes while integrating multiple technologies to improve lithium recovery efficiency.

This study examines lithium carbonate recovery using two membrane-based technologies. The first approach employs electrodialysis metathesis with a module constructed from polypropylene ion-exchange membranes, followed by crystallization. The second approach utilizes Donnan dialysis with a module incorporating anion-exchange hollow fibers followed also by crystallization. The final crystal purities and key process parameters were analyzed and compared.

Both technologies demonstrate significant potential for lithium carbonate recovery, each offering distinct advantages. Electrodialysis excels in producing a high-purity intermediate product and can be adapted to various solution compositions. In contrast, Donnan dialysis operates at lower pressure and energy consumption, making it an energy-efficient alternative. However, both methods also have limitations—electrodialysis requires high energy input, while Donnan dialysis demands a higher purity of the feed solution. Further technological advancements are needed, and the optimal method depends on the quality of the input solution.

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