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MEMBRANE-ASSISTED DIRECT LITHIUM EXTRACTION

by

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ABSTRACT

Direct lithium extraction (DLE) has led to the development of numerous technologies with the potential to recover up to 90% of lithium from various brines through laboratory studies. Nevertheless, establishing a sustainable DLE process that supports a lithium-dependent low-carbon economy still faces challenges. In recent times, there has been a continuous quest for DLE technologies that require fewer pre-treatments, use fewer materials, and employ simplified extraction procedures while ensuring high selectivity for lithium.

This abstract introduces DLE technologies, exploring the different methods used to extract lithium directly from various sources. It discusses the principles, benefits, and challenges associated with these technologies. Moreover, it emphasizes the environmental advantages, sustainability considerations, and potential reduction in carbon footprint achievable through DLE processes, highlighting their capacity to minimize environmental impacts compared to conventional extraction methods.

The economic aspects of DLE, including cost-effectiveness, scalability, and market potential are also explained. Moreover, membrane technology is explored as a disruptive method that could significantly enhance the large-scale implementation of DLE. Dr. Razmjou's team has used several types of building blocks, such as nano-clay, metal/covalent organic frameworks, graphene/oxide, and MXene, to make significant progress in this field by experimentally fabricating membranes. This overview summarizes their findings and outlines the strategies for designing materials to develop lithium-selective membranes incorporating nanochannels and nanopores.

Keywords: Lithium Recovery, Direct Lithium Extraction (DLE), Membrane Technology, Lithium Selective Membranes