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Numerical Modeling of Lithium Adsorption Experiments using Manganese-Chitosan Ion Sieves: Evaluation for Industrial Scalability

In recent years, lithium (Li), which is mostly used for battery components, has emerged as one of the most promising elements for exploration and extraction from underground reserves and used for further industrial applications. In particular, the co-production of Li and heat from geothermal brines offers the advantage of minimal additional environmental impact of Li mining and increasing returns on investment for geothermal operators.

As part of the final objective to develop a process to efficiently and cost-effectively recover Li-ions from geothermal brine, we present a numerical model and sensitivity analysis of critical raw materials (CRM) extraction by implementing an adsorption method in a fixed-bed column model. Batch experiments using synthetic brine under normal and high-temperature conditions were performed to analyze the adsorption equilibrium, kinetics, and breakthrough curves of the system. Sensitivity studies were conducted to identify the influencing parameters and optimize the operating conditions for future upscaling of the process.

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