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Development of novel adsorbent for continuous recovery of lithium ion from seawater

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As the demand for lithium resources rapidly increases due to the growth of the battery market, the lithium reserves of conventional sources such as minerals and brine have been decreasing. Hence, lithium ion recovery technologies are attracting attention from the new source of seawater. In particular, it is considered that the recovery technology through adsorption using lithium ion sieve (LIS) material has the most potential. In this study, a lithium-extracted powder (HMn_2O_4) derived from lithium manganese oxide ($LiMn_2O_4$) was used as a powder-type sorbent, and a fibrous and granular type adsorbents applicable to a continuous flow system was prepared. The fibrous type $LiMn_2O_4$ was prepared via electrospinning and the granule was prepared by mixing $LiMn_2O_4$ powder and binder. First, batch sorption experiments were conducted to evaluate the adsorption characteristics of each type of adsorbents. Overall, Langmuir model and pseudo-second order model well predicted the sorption equilibrium and kinetic regardless of the type of adsorbents. Further, continuous column experiments were carried out to investigate the effect of physical/chemical parameters (e.g., flow velocity, solution chemistry) on lithium ion adsorption characteristics. Comparison of lithium ion breakthrough curves obtained under different test conditions and the relevant mechanisms will be present.
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