

Crown Ether-Decorated Phosphazene-functionalized Magnetic Reduced Graphene Oxide as a Composite Adsorbent Material for Selective Lithium Ion Recovery from Seawater

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A multi-functional composite adsorbent (CE-HCTP-rGO-Fe₃O₄) was successfully synthesized and used as lithium ion (Li⁺) adsorbent from seawater. Reduced Graphene Oxide (rGO) was used as a two-dimensional, high aspect ratio support material, Magnetite (Fe₃O₄) for easy material recovery, Phosphonitrilic Chloride Trimer (HCTP) to increase the attachment sites for Crown Ether (CE), and Crown Ether as Li⁺-selective ionophore. The adsorption experiment at varied Li⁺ concentration revealed the Langmuir-type Li⁺ uptake. The adsorbent is highly selective towards Li⁺ as compared to other cations present in seawater, such as Na⁺, K⁺, Mg²⁺, and Ca²⁺. It can be easily separated via external magnet and re-used. Overall results demonstrate the high adsorption capacity and suitability of CE-HCTP-rGO-Fe₃O₄ for long-term adsorption applications. This work was supported by the National Research Foundation of Korea (NRF) funded by the Ministry of Science and ICT (No. 2016R1A2B1009221 and No. 2017R1A2B2002109), and the Ministry of Education (No. 2009-0093816).