

$\text{Li}_{1-x}\text{Ni}_{0.33}\text{Co}_{1/3}\text{Mn}_{1/3}\text{O}_2/\text{Ag}$  for electrochemical lithium recovery from brine

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Delithiated  $\text{Li}_{1-x}\text{Ni}_{1/3}\text{Co}_{1/3}\text{Mn}_{1/3}\text{O}_2$  (NCM) paired with silver (Ag) is introduced as a new electrochemical system for  $\text{Li}^+$  recovery from brine. NCM is characterized by its high  $\text{Li}^+$  selectivity and stability in aqueous environment. At an applied current in brine, NCM was able to intercalate  $\text{Li}^+$  into its lattice while the Ag captured the  $\text{Cl}^-$  counter-ion. Reversal of the current in a receiving solution prompted the release of LiCl. Under optimal conditions ( $i = \pm 0.25 \text{ mA cm}^{-2}$ ), NCM can produce 96.4% pure  $\text{Li}^+$  from brine by expending  $2.60 \text{ W} \cdot \text{h mol}^{-1} \text{ Li}^+$ . The NCM/Ag was able to perform consistently and produce an enriched LiCl solution in cycled operations. These promising results indicate that NCM/Ag can be developed as a high-throughput  $\text{Li}^+$  mining process with low energy requirement. This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (2018R1D1A1B07048007 and 2009-0093816) and by the Ministry of Science and ICT (No. 2017R1A2B2002109).