$Li_{1-x}Ni_{0.5}Mn_{1.5}O_4$/Ag for electrochemical lithium recovery from brine and its optimized performance via response surface methodology

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Electrochemical Li^+ recovery using delithiated $Li_{1-x}Ni_{0.5}Mn_{0.5}O_4$ (NMO) paired with silver (Ag)was investigated. Using brine as Li^+ feed source, NMO/Ag electrochemically captured Li^+ and Cl^- at an applied current (*C*-rate) and operation time (min $step^{-1}$). The captured ions were subsequently released as LiCl in a recovery solution by reversing the current polarity. Process optimization through response surface methodology using central composite design revealed optimum conditions at *C*-rate = 1.05C for t = 20 min $step^{-1}$with only 1.30 – 1.50 W•h mol^{-1} Li^+ to recover 1.25 mmol Li^+ g^{-1} NMO at 98.1 % Li^+ purity. In cycled experiments (n = 20), NMO/Ag selectively accumulated Li^+ from brine demonstrating its stability and selectivity. This research was supported by Basic Science Research Program through the NRF of Korea funded by the Ministry of Education(2018R1D1A1B07048007 and 2009-0093816) and by the Ministry of Science and ICT (No. 2017R1A2B2002109).