An Electrochemical Cell for Selective Lithium Capture from Seawater

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With active ongoing research in battery technology for the realization of electric vehicles, there are concerns regarding the availability of lithium (Li) resources. Accordingly, securing a steady, cheap supply of lithium resources is a crucial step in realizing a sustainable future. This has led to investigations of novel Li capture processes that are cheaper and faster than before, only to be met with little success. In the present investigation, we have built a highly selective and reversible Li capture system by constructing an electrochemical cell that overcomes the existing limitations. LiFePO4 (LFP) was chosen as active material due to its appropriate working potentials within stable windows of water at all pHs as well as its structural advantages for the selectivity over Na ions. Also, mussel-inspired polydopamine (pD) was used to coat LFP powder to control interfacial energy penalty and thus the ionic selectivity. Moreover, a reversible I-/I3- redox couple was engaged in the working electrode (WE) to facilitate the redox reaction in the LFP counter electrode (CE) in a sustainable fashion. With this newly devised system, the present study pays attention to the interfacial and electrode material properties that affect selective Li capture.