

New bi-functional additive enabled stable cycling Li-metal batteries

이선화, 선양국†

한양대학교

(yksun@hanyang.ac.kr†)

emerging as promising energy storage devices because of their high energy density. However, Li/Ni-rich NCM batteries have been plagued by the issue of the thermodynamic instability of the Li metal anode and aggressive surface chemistry of the Ni-rich cathode. In this work, we propose a bifunctional additive, adiponitrile which can effectively stabilize both the Li metal anode and Ni-rich NCM cathode interfaces. In the Li/Ni-rich NCM battery, the addition of 1 wt.% adiponitrile in carbonate based electrolyte helps to produce a conductive and robust Li anode/electrolyte interface, while the strong coordination between Ni⁴⁺ on the delithiated Ni-rich cathode and the nitrile group in adiponitrile reduces parasitic reactions between the electrolyte and Ni-rich cathode surface. Therefore, upon using 1 wt.% adiponitrile, Li/Ni-rich NCM (Li[Ni_{0.75}Co_{0.10}Mn_{0.15}]O₂) battery achieves an unprecedented cycle retention of 75% over 800 cycles even under high capacity loading of 1.8 mAh cm⁻² and fast charge-discharge time of 2 h.