Enhancing electrochemical performance of high voltage (4.6V) Li metal/$LiNi_{0.5}Mn_{0.3}Co_{0.2}O_2$ cell by the novel additive [4,4'-bi(1,3,2-dioxathiolane) 2,2'-dioxide in the lithium ion batteries

Sang Hyun Lee [a], Sukeun Yoon [b], Eui-Hyung Hwang [c], Young-Gil Kwon [c], Kuk Young Cho [a]
[a] *Department of Materials Science and Chemical Engineering, Hanyang University, 55 Hanyangdaehak-ro, Sangrok-gu, Ansan, Gyeonggi-do, 15588, Republic of Korea*
[b] *Division of Advanced Materials Engineering, Kongju National University, 1223-24 Cheonan-daero, Cheonan, Chungnam, 31080, Republic of Korea*
[c] *R&D Team, LiChem Co. Ltd, 2423-16 Geumsan-ro, Chubu-myeon, Geumsan-gun, Chungnam, 32715, Republic of Korea*

E-mail: *shlee022@hanyang.ac.kr*

Higher energy density of lithium ion batteries (LIBs) is much required to satisfy the mid- and large-sized energy storage devices. High-voltage operation of LIBs is an indispensable approach to obtaining high energy density, especially for $LiNi_{0.5}Mn_{0.3}Co_{0.2}O_2$ (NMC532) cathodes. However, the structural collapse of cathode and electrolyte decomposition increases rapidly during cycling when the batteries are charged to a high-voltage. To enhance the electrochemical performances of NMC532 cathodes under high-voltage condition, [4,4'-bi (1, 3, 2-dioxathiolane)] 2,2'-dioxide (BDTD) is introduced as a novel electrolyte additive. BDTD plays an important role as an effective cathode film forming materials. It can be ascribed to the suppression of electrolyte decomposition owing to the preferential oxidation of BDTD to the electrolyte solvents. We can observe enhancement on the cycle performance with the BDTD additive on the NMC532 from the cycle test. Scanning electron microscope (SEM) and X-ray photoelectron spectroscopy (XPS) of cells reveal that BDTD forms stable solid electrolyte interface (SEI) on the cathode surface. Consequently, BDTD electrolyte additives are desirable for enhancing the overall electrochemical performance of NMC532 cathodes in high-voltage operation.

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