Fabrication of Li powder coated separator to reduce irreversible loss of various anodes for lithium ion battery.

Sun Woo Hwang, Jun Kyu Lee, Woo Young Yoon*

Department of Materials Science and Engineering, Korea University, 1, 5Ga, Anam-dong, Sungbuk-Gu, Seoul 136-701, Republic of Korea

*Corresponding author: E-mail address: wyyoon@korea.ac.kr; Tel.: +82 2 3290 3274; Fax: +82 2 928 3584

In silicon monoxide (SiO_x) anodes, a Li powder coating of the anode has been reported to reduce the irreversible capacity drop in the first cycle. In this study, instead of modifying the electrodes, Li powder was loaded on a separator to overcome the large irreversible capacity loss. A SiO_x anode and a lithium-cobalt oxide (LCO) cathode coin-cell (CR2032) were assembled with a Li-coated separator in a dry room. The charge capacity of the cell using the Li-coated separator was 1502.0 $mAhg^{-1}$ in the first cycle at 0.1 C, while in the case of the uncoated separator was 1534.3 $mAhg^{-1}$. In addition, the Li-powder-coated separator in the cell showed a discharge capacity of 1334.2 $mAhg^{-1}$, which was higher than that of the cell equipped with an uncoated separator (1019.3 $mAhg^{-1}$). Electrochemical analysis proved that the capacity decrease in the first cycle was reduced to 11.2%, compared with a 33.6% capacity loss in the pure SiO_x anode. The Li-coated separator was also effective on Graphite and Silicon anodes. In Graphite anode, irreversible capacity loss of first cycle was reduced 8.2% while pure Graphite was 13.4%. The irreversible capacity of Silicon anode was also improved 27.6% to 12.6% when Li-coated separator used. The morphology changes in the Li-coated separator were observed by scanning electron microscopy (SEM). The results mean that Li coating, even on a separator, could play the role of an effective reserve layer that can compensate for the irreversible capacity loss during the first stage.

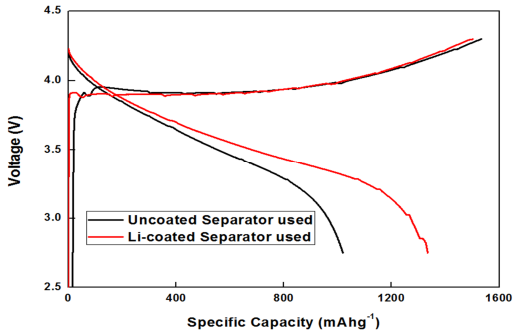

Fig. 1. First cycle voltage profiles for uncoated separator used and Li-coated separator used in the SiO_x-C/LCO full cell.

Reference to a journal publication
[1] Mariko Miyachi,a,z Hironori Yamamoto, Hidemasa Kawai, Tomoyuki Ohta, and Masato Shirakata., *J Electrochemical Soc.*, 152 (10) A2089-A2091 (2005)
[2] I.W. Seong, W.Y. Yoon., J. Power Sources, 195 (2010) 6143.