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Composite protection layer coated patterned lithium-metal anode for lithium secondary batteries

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To increase lithium secondary batteries (LiSBs) energy density, commercialized graphite as anode material has limits due to their low capacity. Therefore, Li-metal is an ideal anode material for LiSBs due to its extremely high theoretical specific capacity, low density and the lowest negative electrochemical potential. However, unpredictable dendritic lithium growth and limited Coulombic efficiency during Li charging/discharging in these batteries have prevented their practical applications. In order to solve this problem, in our previous work, micro-patterned Li-metal anode was used in LiSBs material. LiSBs using micro-patterned Li-metal anode show good cycle life and low resistance during charging/discharging process with low current density (about 0.5 C). But, because of generating bulky lithium deposition in the micro-patterned Li-metal hole during charging/discharging process with high current density, the cell still shows bad cycling life and low Coulombic efficiency. In this paper, in order to enhance cycle life with high current density, composite protection layer (CPL) is introduced in LiSBs using micro-patterned Li-metal. The cell shows good cycling life and low resistance during high current charging/discharging process; because of mechanical suppressing of generating bulky lithium deposition in the macro-patterned Li-metal hole and enhancing of interfacial stability between electrode and electrolyte.

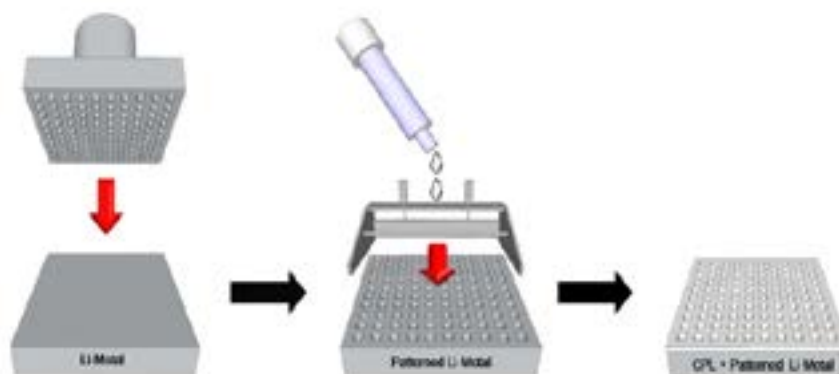


Figure 1: Process of composite protection layer coating on patterned lithium metal surface.

Biography

S W Kim has been studying lithium secondary batteries at Hanbat National University as M. S candidate. He intensively research on gel polymer electrolyte and lithium metal anode using lithium secondary component.

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