Organic/inorganic Composite Protective Layer Coated Patterned Li-Metal Anode for Lithium Metal Batteries

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To increase lithium metal batteries energy density, commercialized graphite as anode material has limits due to their low capacity. Therefore, Li-metal is an ideal anode material for lithium metal batteries 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 lithium metal batteries material. lithium metal batteries using micro-patterned Li-metal anode show good cycle life and low resistance during charging/discharging process with low current density (about 0.5C). But, because of generating granular 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 work, in order to enhance cycle life with high current density, composite protection layer (CPL) is introduced in lithium metal batteries 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 granular lithium deposition in the macro-patterned Li-metal hole and enhancing of interfacial stability between electrode and electrolyte.

References:

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