Self-Healing Li Metal Anodes Prepared Using Calendared Li Metal Powder for Improving Cycle Life and Rate Capability

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The commercialization of Li metal electrodes is a long-standing objective in the battery community due to its high theoretical specific capacity of 3,860 mAh g^{-1} and lowest potential of -3.040 V vs. SHE. To accomplish this goal, the formation of Li dendrites and mossy Li deposition, which cause poor cycle performance and safety issues, must be resolved. In addition, it is necessary to develop wide and thin Li metal anodes to increase not only the energy density, but also the design freedom of large-scale Li-metal-based batteries.

Li metal powder (LiMP) electrodes seems to be a promising means of solving both issues. Using LiMP anode increase the active Li metal electrode surface area to decrease the effective current density in comparison to those of Li metal foils to suppress the formation of dendritic structures. Although LiMP electrodes can be prepared via slurry casting, and the widths of LiMP electrodes are not limited. However, the porous structures of LiMP electrodes are very disadvantageous in terms of achieving high-energy-density batteries. An alternative means of using LiMP involves compressing the LiMP through calendaring.

In this study, we applied a delicate calendaring technique to LiMP electrodes and investigated the correlation between the compression level and electrochemical performance. The properties of Compressed LiMP electrode was studied by using galvanostatic cycling test, scanning electron microscopy (SEM), electrochemical impedance spectroscopy (EIS).

References:

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