

Design Optimization of Micro-patterns in Li Metal Anode

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Lithium metal is the one of promising anode material in lithium secondary battery (LSB) system owing to it's the lowest reduction potential (-3.04 V vs. SHE) and high theoretical capacity ($\sim 3800 \text{ mAh g}^{-1}$). Nevertheless, it has never been commercialized as secondary battery due to the performance degradation and safety issues by the dendrite formation on lithium metal surface. Especially, recently with electric vehicle market increase, the need of lithium metal is going up for securing higher energy density of LSB. Hence, many battery researchers have focused on finding how to suppress the lithium dendrite, various candidate's technology have been reported for it, and the one of them is the micro-patterns technique on lithium metal.

Accumulating experiences from variable pattern experiments about lithium metal, we got the important points of pattern's design that should be considered such as the amount of lithium put in, pattern shape, distance between patterns, etc. In this study, we had made the lithium metal model by using COMSOL Multiphysics to get the optimization design of micro-patterns. Then the tool with micro-patterns had been fabricated based on simulation results of model and micro-patterned lithium metal was made by the tool. Finally, the performance of micro-patterned lithium metal was evaluated by electrochemical tests and it's surface with deposited lithium was observed under SEM images to prove the effect of micro-patterns in lithium metal.

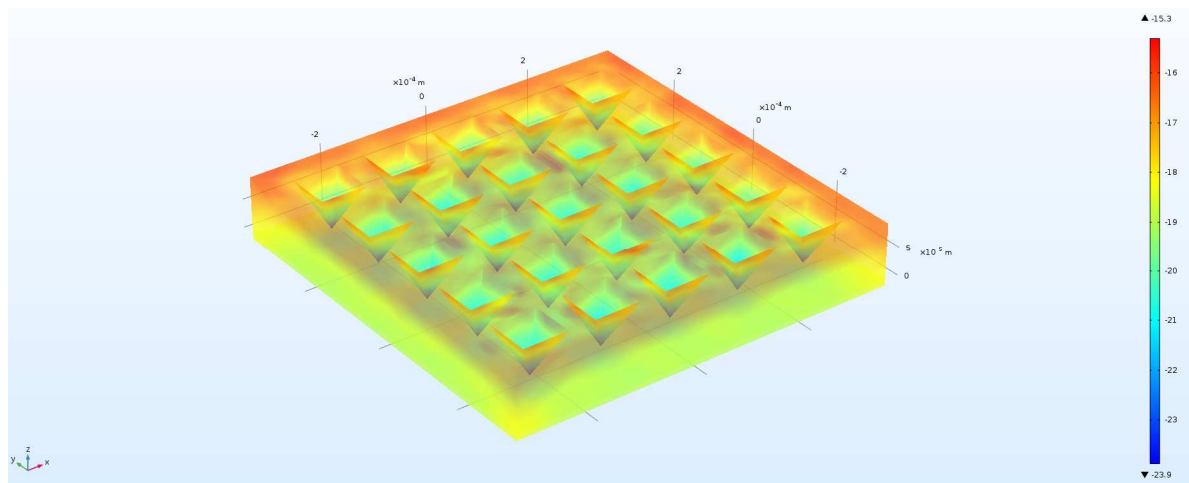


Figure. Current densities on lithium metal surfaces by lithium metal battery model

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