Optimized Pulse Form for Extreme Inhibition of Growing Microstructures during Electrodeposition

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Abstract

The formation of branched microstructures during the electrodeposition is a catastrophic event for the utilization of the metallic electrodes in rechargeable batteries. Taking into account the dynamics of the growth of the dendritic microstructures, we tune the form of the feeding pulse charge inversely for minimizing the amount of dendritic branching, while maintaining a constant feeding charge. The ultimate morphology of the electrodeposits has been shown to be more compact than the conventional uniform charging in terms of the density of the electrodeposits. Due to analytical derivation and comparative development of the optimal pulse form with respect to the natural kinetics of dendritic evolution, we infer that it prevents the branching of the electrodeposits to the greatest extent, during the stochastic evolution of the dendrites.

Keywords: Pulse Optimization, Dendritic Growth, Electrodeposition, Analytical Development.

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