

Nanomaterials Design and Cryo-Electron Microscopy for Batteries

Yi Cui^{a, b}

^a *Department of Materials Science and Engineering, Stanford University*

^b *Stanford Institute for Materials and Energy Sciences, SLAC National Accelerator Laboratory, California, USA*

E-mail: yicui@stanford.edu

New generation of battery materials are accompanied by large volume and structure change and instability of interphase. Nanoscale materials design represents a new powerful paradigm shift and offers new solutions to address these challenges. Here I will present our recent progress on: 1) Nanoscale design of host and interface for Li metal anodes; examples of host materials include graphene oxides, hollow carbon spheres, metal fluoride and oxide. We also developed robust interfacial layer materials and synthesis process for BN, Li₃N and LiF. 2) Discovery of sulfur cathode phase behavior, leading to new guidance to materials design; 3) The first successful example of cryogenic electron microscopy applied to battery materials research, leading atomic scale resolution of Li metal dendrite and solid electrolyte interphase.