

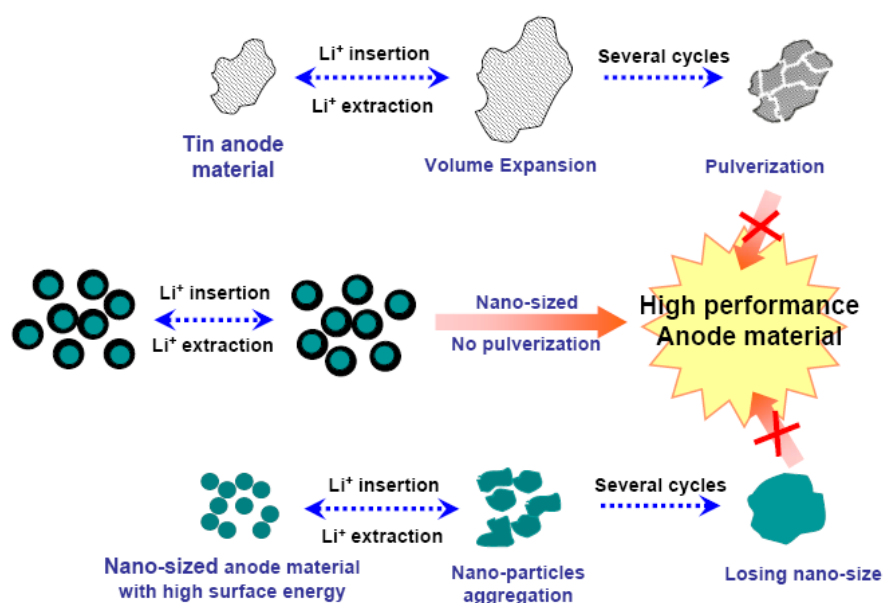
Supporting Information

Core-Shell Carbon-Coated Cu_6Sn_5 Prepared by *In Situ* Polymerization Method as a High-performance Anode Material for Lithium-Ion Batteries

*Wang-jun Cui, Feng Li, Hai-jing Liu, Cong-xiao Wang, and Yong-yao Xia**

Department of Chemistry and Shanghai Key Laboratory of Molecular Catalysis and
Innovative Materials, Institute of New Energy, Fudan University, Shanghai 200433,

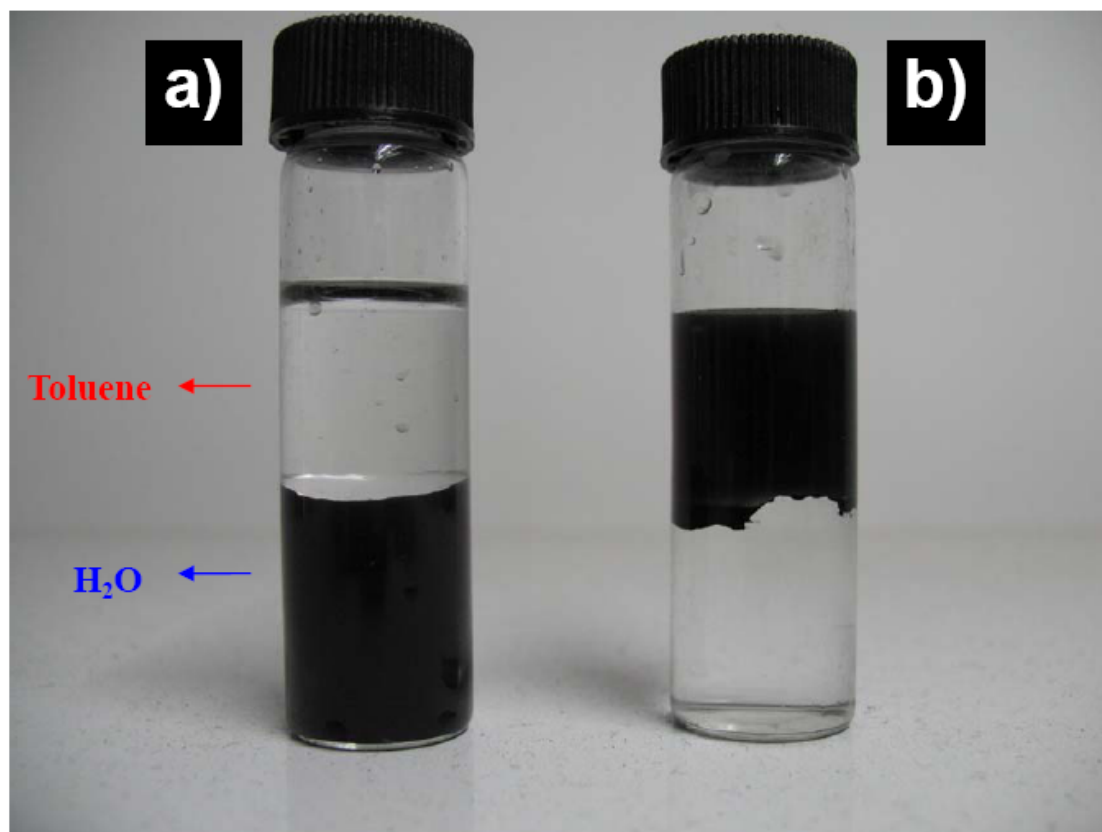
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Photos and Figures:

S1. Schematic diagram of the reaction routes of tin-based alloy anode during alloying and dealloying reaction with Li⁺ ions.

For Sn-based materials, the particle size is in the micrometer range (the upper portion of the figure), and the most critical problem for such materials is a severe volume expansion/contraction. Sn metal particles are pulverized and eventually lose its Li⁺ storage ability. For nano-sized materials (the bottom portion of the figure), a partial improvement was achieved by reducing the absolute volume change, but extremely small metal particles are aggregated into larger particles during the alloying and dealloying reaction, and then pulverized again. The Sn-based materials will deliver a poor cycling stability in the two cases mentioned above. The core-shell structure of the carbon-coated Sn-Cu alloy developed in the present work combines

merits of intermetallic compounds and the nanoscale effect. The acquired material can be expected to be of a high performance (the middle part of the figure).



S2. The photo of nano-sized Cu_6Sn_5 particles dispersed in a toluene (upper)/ H_2O (below) mixture solution. a) before and b) after the hydrophobic surface modification.

The nano-sized Cu_6Sn_5 obtained by a sodium borohydride reduction method is hydrophilic. In order to prepare uniform core-shell carbon-coated nanoscale Cu_6Sn_5 , the Cu_6Sn_5 particles was treated by a hydrophobic reagent 1-dodecanethiol, which can be “grafted” on the alloy particles by metal-sulphur bonds to keep them stable, while

alkyl chains pointing to outside make the particles disperse well in the organic phase (toluene). This is a key point to guarantee the polymerization to occur on the single particle surface and to ensure that the polymer layer firmly coats the surface.