csurf
Technology Transfer Office

Colorado State University

Direct Electrodeposition of Crystalline Intermetallic Compounds at a Single Potential

Researchers in the Colorado State University Department of Chemistry have developed a method for the direct electrodeposition of intermetallic compounds at a single electrochemical potential. By carefully controlling the speciation of the deposition solution, two different metals may be simultaneously deposited onto an electrode surface at constant potential, resulting in crystalline films of intermetallic compounds. Using this novel technique, researchers have successfully deposited Cu_2Sb, a promising anode material for lithium-ion batteries.

Intermetallic compounds are promising alternatives to graphite for lithium-ion batteries as they offer the possibility of improved capacity, their reaction with lithium is highly reversible, and the lithium intercalation potential is ideally suited to prevent the deleterious deposition of elemental lithium on the electrode. In contrast to other intermetallic species, Cu_2Sb displays relatively little volume change upon intercalation and discharge of lithium ions, a trait which minimizes irreversible capacity loss and greatly extends the cycle life of the battery. Intermetallics are also of interest in the areas of thermoelectrics and memory devices.

Until now, the simultaneous electrodeposition of copper (Cu) and antimony (Sb) has been difficult due to the difference in solubility and reduction potentials of these two metals. With the proper selection of ligand, solution pH, and the concentration of each metal species in solution, the deposition potential of the disparate metals may be brought together to allow for the stoichiometric deposition of Cu_2Sb at a single potential. In principle, this technique is generally applicable and may be used to electrodeposit a variety of intermetallic species.

ID: CSURF 08-038

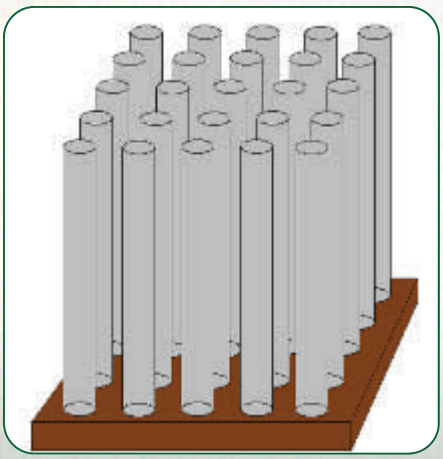
Patent Information
Patent pending

Inventor Information
Dr. Amy Prieto
Mr. James Mosby
Ms. Jennifer Noblitt

Related Technologies
CSURF 08-037

Features and Benefits

- Affords control over the composition, crystallinity and thickness of the deposited material.
- Intermetallics may be deposited in complex shapes, in deep recesses and with nanoscale dimensions.
- Excellent electrical contact without post-annealing or other further processing.
- Cu_2Sb is a promising anode material for lithium-ion batteries.



Contact Information:
Jeremy Nelson
Phone: 970.482.2916
Email: jeremy.nelson@colostate.edu
www.csurf.org/tto