

Negative Electrodes Improve Safety in Lithium Cells, Batteries (ANL-IN-01-022)

Enhanced stability at a lower cost

The Invention

Argonne scientists have developed a new class of intermetallic material that can be used for the battery's negative electrode. Compared to graphite, the novel material offers significantly higher volumetric and gravimetric capacity and improves battery stability and safety.

Conventional lithium-ion batteries often contain extremely reactive graphite electrodes that operate at a potential very close to that of metallic lithium. This composition can cause batteries to overheat, particularly if the battery is charged or overcharged without protective electronic circuitry.

The structure of the new intermetallic electrode is represented by the formula M_2M' , in which M and M' consist of two or more metal elements, including silicon, and have a Cu_2Sb -type structure. The M' atom configuration is close to an ideal face-centered, cubic array of atoms and provides a host framework for the M atoms in the parent structure and for lithium atoms during the electrochemical reaction.

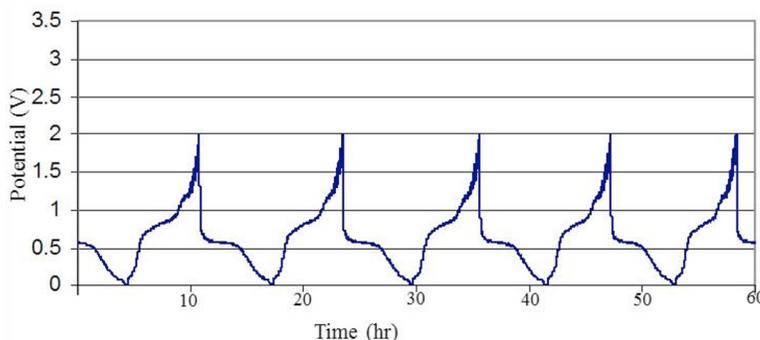
Scientists at Argonne National Laboratory are leading efforts to revolutionize battery technology with the design and development of new battery materials for electrolytes, electrodes, and interfaces that will increase the specific energy of advanced batteries while simultaneously providing enhanced stability at a lower cost.

Benefits

- ▶ Significantly increased energy density
- ▶ Improved safety
- ▶ Increased reliability
- ▶ Greater structural stability
- ▶ Superior charge capacity

Applications and Industries

- ▶ Transportation applications, such as electric and hybrid-electric vehicles
- ▶ Portable electronic devices, such as cell phones and laptop computers
- ▶ Medical devices
- ▶ Space, aeronautical and defense-related devices



Mn₂Sb vs cell showing excellent overall capacity and capacity retention.

Developmental Stage

Under development

Availability

Available for licensing

Argonne Invention Number

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Patent Information

US Patent 6,855,460

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Argonne Technology Development and Commercialization

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