

Layered Electrodes for Lithium Cells and Batteries (ANL02010)

Layered lithium metal oxide compounds for ultra-high capacity, rechargeable cathodes.

The Invention

High-capacity, rechargeable cathodes made of stable di-lithium layered compounds (Li_2MO_2) ($\text{M}=\text{Li}, \text{Ni}, \text{Mn}$) for use in Li batteries. The electrode capacities exceed 500 mAhg^{-1} when two lithium cations are cycled, giving this material very high energy. Li_2MO_2 is a good chemical precursor to fabricate cathodes with new composite layered LiMO_2 or LiM_2O_4 spinel structures that possess excellent cycling reversibility. Li_2MO_2 can also be used as a reversible anode when cycled below 1.5 V.

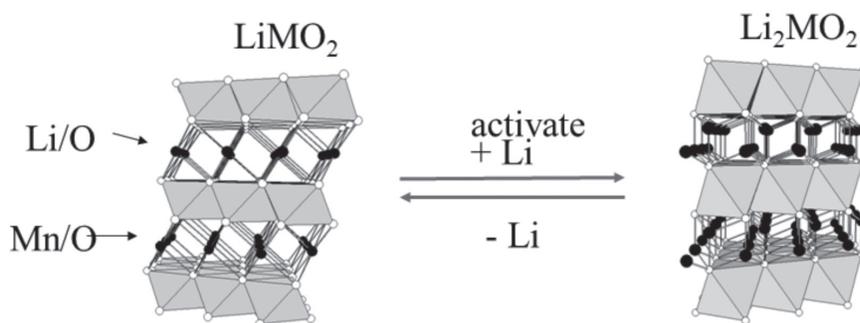
Benefits

- ▶ Li_2MO_2 , as a layered precursor chemical, can be used to create LiMO_2 composite cathodes with high-capacity and high energy which are superior to state-of-the-art layered lithium/cobalt/nickel/oxide cathodes.
- ▶ Layered Li_2MO_2 cathodes possess capacities of 500 mAhg^{-1} which are much higher than current Li-ion batteries. Because of this, the voltage of the electrochemical reactions can be raised to produce batteries with high energy densities.
- ▶ Manganese, nickel and lithium are used in the compounds, avoiding the use of cobalt, which is expensive and toxic.
- ▶ Low-cost synthesis of Li_2MO_2 by chemical or electrochemical lithiation is a new approach to make cathodes that last longer with low energy losses.

Applications and Industries

Electrodes used in batteries for

- ▶ Electric and plug-in hybrid electric vehicles;
- ▶ Portable electronic devices;
- ▶ Medical devices; and
- ▶ Space, aeronautical, and defense-related devices.



Structure of Li_2MO_2 layered compound showing their use as a precursor for fabrication of reversible LiMO_2 cathode materials

Developmental Stage

Under development

Availability

Available for licensing

Patent Information

US Patent 7,358,009

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