Lithium-excess Molybdenum Chromium Oxides for Lithium Ion Battery Cathodes
Technology #15655

Applications
- Lithium-ion batteries

Problem Addressed

Today, three main types of insertion materials are being studied as lithium ion battery cathodes: nickel manganese cobalt-based layered oxides, nickel manganese-based spinels, and iron-based olivines. While each class has its own strengths, none are ideal. Nickel manganese cobalt-based layered oxides offer high energy density, but have questionable safety and poor rate capability. Manganese-based spinels, on the other hand, have good rate capability but low specific capacity, low energy density, and poor cycle life at high temperature. Lastly, iron-based olivines are cheap, safe, and show good cycle life, but have low gravimetric and volumetric energy density.

Technology

This invention pertains to new layered molybdenum oxides for lithium ion battery cathodes from solid solutions of Li$_2$MoO$_3$ and LiCrO$_2$. The compounds synthesized from this method are of the general formula Li(Li$_{(1-x)/3}$Mo$_{(2-2x)/3}$Cr$_x$)O$_2$, wherein 0 $<$ x $\leq$ 0.5. During the synthesis of compounds described, some loss of lithium may occur, resulting in a substoichiometric amount of lithium relative to the other elements in formula Li(Li$_{(1-x)/3}$Mo$_{(2-2x)/3}$Cr$_x$)O$_2$. Such compounds deficient in lithium are of formula Li$_{(4-x)/3}$w(Mo$_{(2-2x)/3}$Cr$_w$)O$_2$, wherein 0 $\leq$ w $\leq$ 0.2 and w represents a lithium deficiency. The invention encompasses such lithium deficient compounds, materials comprising such compounds, and their uses.

Advantages
- High energy density
- Good rate capability
- Great safety against oxygen release at charged state due to their low voltage

Categories For This Invention:

Energy
Energy Storage
Batteries
Lithium Batteries

Intellectual Property:

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High-capacity positive electrode active material
Issued US Patent
9,780,363
Molybdenum oxides and uses thereof
Issued US Patent
9,960,417
High-capacity positive electrode active material
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