Technology Readiness Level: 4
Component and/or Breadboard Validation in Laboratory Environment

Eltron Research & Development

Tech Brief

Lithium Phosphate Cathode Materials

A novel, low cost synthesis method

Benefits

- Minimal number of process steps reduces operating costs
- Applicable to multiple compounds
- Thermally stable
- High surface area
- Specific capacity up to 163 mAh/g
- Surface area up to 100 m^2/g

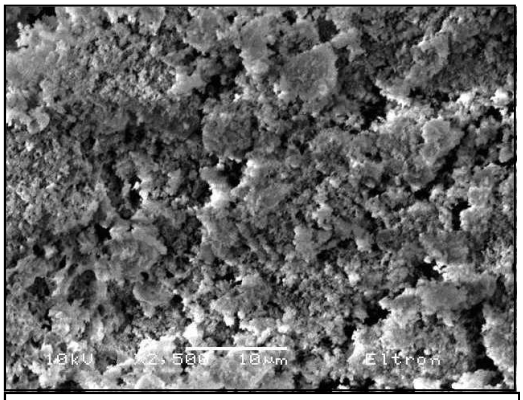
The Problem

Lithium metal phosphates have emerged as the cathode material of choice for the next generation of lithium-ion secondary batteries used in portable electronics, power tools, and hybrid or electric vehicles. Phosphate cathodes are environmentally friendly and have been shown to possess high specific capacities and thermal stability.

Current production methods for phosphate cathode powders include carbothermal reduction and solid state processing. Carbothermal reduction is a multi-step, labor intensive process that requires addition of elemental carbon as a reducing agent to the reactant mixture. A beneficial residual carbon coating remains on the phosphate product following calcining. Solid state processing requires calcination under a 100% H_2 reducing atmosphere and does not produce a beneficial carbon layer on the phosphate product.

The Solution

Eltron has developed a low-cost process for preparation of high surface area phosphate compounds for application as cathodes in lithium-ion secondary batteries. This simple process produces high surface area cathode powder with a beneficial residual carbon coating on the powder, but does not require the additional of elemental carbon during the calcining step.



x2500 SEM image

Optical image of LiFePO4 powder prepared at Eltron R&D.

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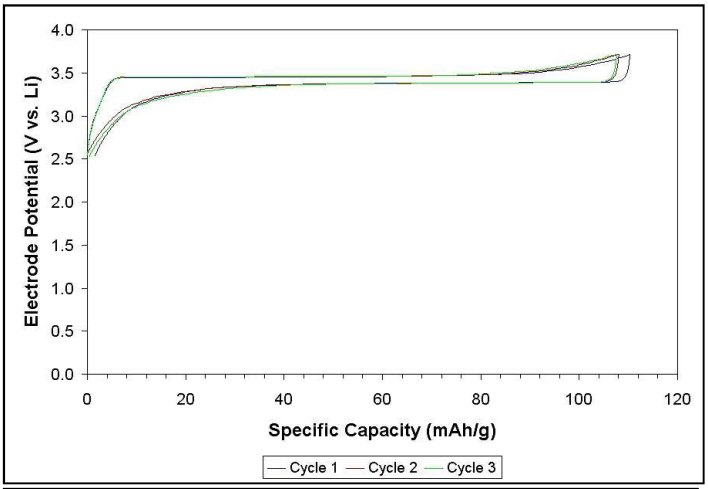
Eltron has demonstrated preparation of five different compounds including $LiFePO_4$, $Li_3V_2(PO_4)_3$, α-$LiVOPO_4$, ß-$LiVOPO_4$, and $LiVP_2O_7$. Cathode powder performance has been demonstrated in test cells under various C-rates and repeating charge/discharge cycling.

Eltron is continually improving this synthesis process to increase cathode performance and explore new high voltage lithium phosphate cathode compounds.



C/25 cell cycling for a battery containing a LiFePO-4 cathode.

Highlights

Eltron's synthesis method includes these advantages:

- Demonstrated specific capacity up to 163 mAh/g for $Li_3V_2(PO_4)_3$ cathode powder
- Improved performance through high surface area products (up to 100 m^2/g)
- Reduced production cost due to fewer processing steps
- Flexible processing for production of different phosphate compounds
- Inert or partially reducing (10% H_2) calcining atmosphere
- Thermally stable materials
- High purity powders

Stage of Development

Eltron's novel synthesis process has been validated by industry experts and patented. A related patent application, 11/753,485 *Synthetic Process for Preparation of High Surface Area Electroactive Compounds for Battery* Applications, has been filed with the USPTO.

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Contact Us

To discuss the possibility of entering into a business relationship with Eltron, contact the Business Development Group at business@eltronresearch.com.

To learn more about Eltron Research & Development's lithium metal phosphate process and the many other technologies that the company is researching and commercializing, visit www.eltronresearch.com.

Eltron Research & Development

Eltron Research & Development Inc.

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4600 Nautilus Court South | Boulder, CO 80301 | Phone: 303.530.0263 | www.eltronresearch.com