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Laser additive manufacturing method for producing porous layers

Tech ID: 32476 / UC Case 2020-670-0

CONTACT

Ben Chu
ben.chu@uci.edu
tel: .



INVENTORS

» Xin, Huolin

OTHER INFORMATION

CATEGORIZED AS

- » **Energy**
 - » Storage/Battery
- » **Materials & Chemicals**
 - » Other
- » **Engineering**
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BRIEF DESCRIPTION

The inventors at UCI have created a method of doping layered cathode materials in sodium-ion batteries. In this method more than five impurity elements are introduced into a host material, in this case a sodium-based layered cathode material, $\text{Na}_{0.667}\text{Mn}_{0.666}\text{Ni}_{0.167}\text{Co}_{0.167}\text{O}_2$. This technique is being utilized in order to create sodium-ion batteries that are more competitive with the historically used lithium-ion battery.

SUGGESTED USES

·Creation of sodium-ion batteries with high energy density and comparatively long life cycle

FEATURES/BENEFITS

- High discharge capacity at low rate
- Discharge capacity at 1 hour charge/discharge is high relative to Li-ion batteries
- Capacity fading of material is much slower than the baseline $\text{Na}_{0.667}\text{Mn}_{0.666}\text{Ni}_{0.167}\text{Co}_{0.167}\text{O}_2$ material
- Impedance develops much slower than the baseline $\text{Na}_{0.667}\text{Mn}_{0.666}\text{Ni}_{0.167}\text{Co}_{0.167}\text{O}_2$ material
- Reduced reliance on toxic element cobalt in comparison with the baseline material

TECHNOLOGY DESCRIPTION

Li-ion battery technology has been the historical go-to for powering portable devices and vehicles. However, lithium is sourced only from a handful of countries and is difficult to recycle. Sodium, on the other hand, is an element which is widely abundant and inexpensive. There are several issues which have, in the past, kept Na-ion batteries from becoming the standard. Sodium cathode material is low in specific capacity, does not have a good rate performance, and has an unsatisfactory life cycle.

To combat these issues, the researchers at UCI have developed a method of doping layered cathode materials called “high entropy” or “cocktail” doping. In this method more than five impurity elements are introduced into the host material, in this case a sodium-based layered cathode material, $\text{Na}_{0.667}\text{Mn}_{0.666}\text{Ni}_{0.167}\text{Co}_{0.167}\text{O}_2$. This technique allows production of sodium-based cathode materials with high discharge capacity and relatively slower capacity fading than other baseline materials.

STATE OF DEVELOPMENT

The researchers are working on a prototype.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20230352672	11/02/2023	2020-670

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ [A New Doping Strategy for Layered Oxide Electrode Materials Used in Lithium-Ion Batteries](#)

