Novel Metal Chalcogenides For Pseudocapacitive Applications

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SUMMARY

UCLA researchers in the Department of Chemistry and Biochemistry have developed a novel metal chalcogenides for pseudocapacitive applications.

BACKGROUND

Variability in the demand for power and the intermittent nature of renewable energy sources like solar and wind has made the need for energy storage a necessity. Current storage technologies like batteries and supercapacitors fall short in terms of power output, charging time, or in their ability to store enough energy (density). Pseudocapacitors have features of both technologies and offer an alternative to stabilize the power supply. They possess high rates of charge and discharge and are capable of storing much more energy in comparison to a supercapacitor. An attractive pseudocapacitor option is those with metal chalcogenide electrodes, they yield storage devices that can be charged in minutes and have high power density. However, these devices often have short lifetimes (~300 cycles) limiting their utility. The development of a novel long-lifetime metal chalcogenide pseudocapacitor electrode that can maintain high charge density and charge rates would revolutionize the battery field.

INNOVATION

Prof. Sarah Tolbert and colleagues at UCLA have developed novel metal chalcogenide (MoS2) nanocrystal electrode architecture for pseudocapacitive applications. Their innovation enables for rapid charging of high density with longer cell lifetime (~3000 cycles) with minimal capacity loss. Additionally the production of the nanocrystal is economic and scalable. This advancement will not only increase the utility of pseudocapacitors, but also have impacts in technologies ranging from regenerative braking found in the auto industry to energy storage for alternative energy.

APPLICATIONS

- The present technology is useful for forming electrodes of Li-, Na- and Mg-ion batteries, especially for fast charging devices requiring both high energy and power densities.
- Applications in regenerative braking technologies, electric car batteries, and energy storage for alternative energy (e.g. wing and solar).

ADVANTAGES

This technology allows for rapid charging (in minutes), high energy storage density, and longer cell lifetimes over traditional metal chalcogenide electrode pseudocapacitors (as well as traditional batteries and supercapacitors).

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,734,649	08/04/2020	2016-178

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

CONTACT

UCLA Technology Development Group
ncd@tdg.ucla.edu
tel: 310.794.0558.

INVENTORS

- Tolbert, Sarah H.

OTHER INFORMATION

KEYWORDS

pseudocapacitor, metal chalcogenides, metal chalcogenide pseudocapacitor, energy storage, battery, electrochemical cell, supercapacitor, MoS2 electrode, metal chalcogenide electrode pseudocapacitor, metal chalcogenide electrode, MoS2 electrode

CATEGORIZED AS

- **Energy**
  - Storage/Battery
- **Engineering**
  - Engineering
- **Materials & Chemicals**
  - Nanomaterials
  - Storage
- **Nanotechnology**
  - Electronics
  - Materials
  - Other

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UCLA Technology Development Group

10889 Wilshire Blvd., Suite 920,Los Angeles,CA 90095

https://tdg.ucla.edu

Tel: 310.794.0558 | Fax: 310.794.0638 | ncd@tdg.ucla.edu