Composite Membranes For Energy Storage Devices

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BACKGROUND

Dendritic growth inside a high capacity electrochemical system can initiate self-discharge and a very dangerous set of reactions that result in cell temperatures reaching >500 °C within seconds of internal shorting. Thus, cell components are often designed with shut-off features that engage after shorting occurs and cell temperature begins to rise, but before a threshold temperature is reached (e.g. runaway temperature). For example, some separator membranes can be designed to collapse in response to high temperatures, blocking ion-flow and effectively shutting off the cell. However, this process is irreversible and will not prevent thermal runaway if a critical temperature is reached before proper shutoff can occur. Additionally, such membrane will have little effect if the short circuit occurs from separator penetration by a metallic dendrite. Reversible thermo-responsive membranes have been developed, but share similar drawbacks during internal shorting and rapid self-discharge.

TECHNOLOGY DESCRIPTION

Researchers at UC San Diego have developed materials, methods and articles of manufacture pertaining to novel composite membranes that can be used to detect and prevent internal shorting as may occur in an electrochemical storage device. As an additional component in high capacity devices, such membranes can improve safety by preventing the rapid self-discharge that occurs particularly when metallic dendrites grow to penetrate the electronically resistive separator.

APPLICATIONS

Energy storage, electric vehicles

ADVANTAGES

New safety mechanism for batteries, allows for short circuit current monitoring, adaptable to various types of energy storage devices.

STATE OF DEVELOPMENT

Prototyping stage

INTELLECTUAL PROPERTY INFO

This invention has a provisional patent application.

PATENT STATUS

Patent Pending

CONTACT
University of California, San Diego
Office of Innovation and Commercialization
innovation@ucsd.edu
tel: 858.534.5815.

OTHER INFORMATION

KEYWORDS

Energy storage, battery, composite membrane, dendritic growth, shorting detection, shorting prevention

CATEGORIZED AS

- **Energy**
  - Storage/Battery
- **Materials & Chemicals**
  - Composites

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