Knowledge Transfer Office
香港城市大學
City University of Hong Kong

Covalent Organic Framework and its Electrochemical Use

Energy & Environment

Manufacturing

Electricity and Power Electronics

Nanotechnology and New Materials

Opportunity

Although lithium-ion batteries have long been used in various industries worldwide due to their good stability and performance, they are expensive and have some safety-related drawbacks. Researchers have explored potential alternatives, such as sodium-ion batteries, but they have been limited by the difficulty in obtaining appropriate cathode materials that would yield high performance. Organic electrode materials offer several advantages over their inorganic counterparts, including better renewability and potentially higher gravimetric capacities, and some perform well when used to form cathodes for sodium-ion batteries. However, previous development efforts have revealed that such materials are poorly stable over the long term.

IP Status
Patent filed

Technology Readiness Level (TRL) ? 3

Inventor(s)
Prof. ZHANG Qichun
Prof. LEE Chun Sing
WANG Chenchen
XU Shen
Enquiry: kto@cityu.edu.hk

Technology

Researchers have designed a covalent organic framework for use as an electrode material in an energy storage device. This framework contains multiple linked aromatic moieties and results in a porous crystalline material that is highly stable in organic solvents and under harsh conditions, enabling its use in various applications, including drug delivery, electronic devices, gas separation/storage, and various types of energy storage. The researchers further designed an anode composed of this material for use in an energy storage device and described a simple method for electrode production involving the mixing of the preferred aromatic compound with a thiol and degassing of this mixture, followed by heating.

Advantages

- Improved renewability of electrode materials
- Customizable for specific functions
- Increased gravimetric capacity (theoretical)
- Excellent chemical stability in organic solvents and under harsh conditions

Applications

- The covalent organic framework produces a material suitable for use in various types of batteries, including sodium- and lithium-ion batteries in the forms of full and half-coin cells, cylindrical cells, and pouch cells.

- The highly stable material produced using this technique is suitable for use in drug delivery, chemical sensing, and gas separation/storage applications due to the lack of corrosion in organic or highly acidic/basic solutions
- The material is suitable for use in the electrodes of electronic devices.