

International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI)

Balapur P.O., Hyderabad – 500005, Telangana, India



Engineered Carbon Nanomaterials as Anode Material for High-Performance Na-ion Batteries

Overview

Electrical energy storage is one of the most critical needs of 21st century. At present, among various energy storage technologies, Lithium (Li)-ion batteries have conquered the portable electronic market. They have also proven suitable for next generation large scale energy storage (electric vehicle) due to their high energy density and remarkable cyclic life at higher currents. However, Li-ion batteries are expensive due to the heavy capital investment needed in mining and extraction of Li. Li is unevenly distributed in earth crust which is a critical barrier to the scale-up of Li production and thus Li battery energy storage for large-scale applications such as electrical vehicles remains limited. In this perspective, replacing expensive Li based electrodes with a sustainable battery electrode material is a major challenge to meet the increasing demand for portable electronics and zero emission vehicles. Li based active material electrodes and electrolytes may be replaced with the abundant alkaline element in earth's crust with similar characteristics. In this direction, sodium (Na) based rechargeable batteries have been demonstrated with similar energy storage mechanism in 1980.

Key Features

- Na helps in making rechargeable batteries cheaper due to the relatively abundant sodium sources, ease of recovery and usage of water-based electrolytes instead of the organic ones.
- Expensive copper (Cu) current collector can be replaced by lightweight aluminium (Al) current collector for the anode in Na-ion battery, which is electrochemically inactive and does not form an alloy with Na.
- Supports high voltage cathodes.
- Packing technology is similar to Lithium ion battery.

Potential Applications

- Powering up portable electronics to electric vehicle
- Grid storage

Intellectual Property Development Indices (IPDI)

- Various electrolyte compositions for better ionic conductivity are being investigated.
- Engineered carbon Nanomaterials such as carbon nanoparticles and high surface area carbons are being investigated as anode material for Na-ion battery.

Status	1	2	3	4	5	6	7	8	9	10

Centre for Carbon Materials (CCM)

ARCI, Balapur PO., Hyderabad 500005, Telangana, India

Tel : +91 40 24452438 / 24452339; Fax : +91 40 24442699

Email: pkjain [at] arci [dot] res [dot] in / tata [at] arci [dot] res [dot] in