

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

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## Electrodeposited nanostructured NiCo<sub>2</sub>O<sub>4</sub> based electrode materials for supercapacitor applications

### Overview

With the anticipated increase in the renewable wind and solar energy supercapacitors with high specific capacitance and cycle stability have increasing demands to balance the energy storage requirements. NiCo<sub>2</sub>O<sub>4</sub> based electrode materials with excellent electrochemical performance and high theoretical specific capacitance values serve as emerging tool for various applications like HEV's and back-up systems. Further, electrodeposition is a cost-effective mode of synthesis both with respect to the materials employed and the equipment used. The technology aims at the synthesis of binder free electrodeposited NiCo<sub>2</sub>O<sub>4</sub> electrode materials for supercapacitors along with the fabrication of device for practical applications

### Key Features

- Cost effective synthesis strategy
- High specific capacitance (1977 F/g at 1 A/g by half cell and 91.5 F/g at 0.5 A/g by full cell)
- High power density (7.5 kW/kg at 10 A/g)
- Good capacitive retention of the ASC (74% retention for 5000 cycles)

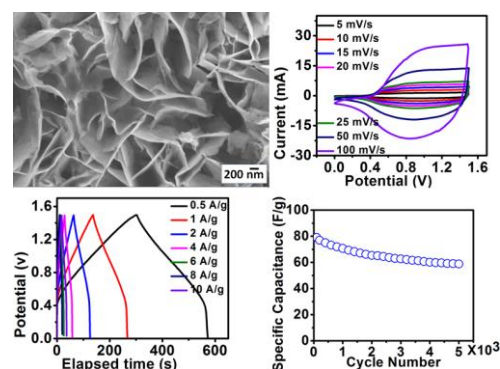
### Potential Applications

- Start-Stop systems
- HEV's
- UPS and back-up systems
- Electronics

### Technology Readiness Level (TRL)

- ASC device performance and stability for 5000 cycles has been validated at lab scale

### Morphology and Electrochemical Characterizations



### Highlights:

- C<sub>sp</sub> of 1977 F/g at 1 A/g by half cell and 91.5 F/g at 0.5 A/g by full cell analysis
- Maximum energy density of 28.59 Wh/kg and a power density of 7.5 kW/kg
- 74% capacitive retention for 5000 cycles

IPDI*	1	2	3	4	5	6	7	8	9	10
Activities	Basic concepts and understanding of underlying scientific principles	Short listing possible applications	Research to prove technical feasibility for targeted application	Coupon level testing in stimulated conditions	Check repeatability/consistency at coupon level	Prototype testing in real-life conditions	Check repeatability/consistency at prototype level	Reassessing feasibility (IP, competition technology, commercial)	Initiate technology transfer	Support in stabilizing production
Status										

\*IPDI : Intellectual Property Development Indices

### Major Patents/Publications

1. Manuscript yet to be published

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