

# **Hierarchical nickel-based metal-organic framework/graphene oxide incorporated graphene nanoplatelet electrode with exceptional cycling stability for coin cell and pouch cell supercapacitors**

## **ABSTRACT**

The utilization of the electrode materials for supercapacitor based on metal-organic frameworks (MOFs) has gained much attraction from researchers, due to their remarkable surface area, tunable pore size, and numerous redox sites. The construction of a hierarchical Ni-MOF/graphene oxide (GO) incorporated graphene nanoplatelet (GNP) exhibited the unique synergistic interaction between two different graphitic carbon structures towards the weak electrical conductivity and stability of pristine MOFs. The introduction of GO and GNP on MOF not only improves the conductivity and stability but also enhances the interfacial interaction and transport kinetics for both electrons and ions between supercapacitor electrodes. Herein, a hierarchical Ni-MOF/GO/GNP electrode fabricated by a facile approach is mounted in a symmetrical coin cell and pouch cell, by using 2.0 M potassium acetate as the electrolyte, to prepare supercapacitors. The constructed coin cell and pouch cell supercapacitor of Ni-MOF/GO<sub>3</sub>/GNP manifest outstanding electrochemical performance with specific capacitances of 102.24 and 70.41 F/g at the current density of 1 A/g, respectively. The extraordinary capacitance retentions of 85.6% and 82.5% are achieved for both cells, respectively, after more than 20,000 cycles. This exceptional outcome is ascribed to the favorable electrochemical kinetics of Ni-MOF/GO<sub>3</sub>/GNP that largely improves the structural stability of the hybrid material.

**Keyword:** Nickel metal-organic framework; Graphene oxide; Graphene nanoplatelet; Coin cell; Pouch cell; Supercapacitor