**Reduced Graphene-Zinc Cobalt Sulfide Nanosheet Wrapped Ni-Foam for Enhanced Supercapacitor Applications**

**ABSTRACT**

Madhabi Konwar1, Dr. Lakhya Jyoti Borthakur2

1Department of Chemistry, Gauhati University, India

2Department of Chemistry, Nowgong College (Autonomous) India

[madhabigu2019@gmail.com](mailto:madhabigu2019@gmail.com)

[lakhyab@gmail.com](mailto:lakhyab@gmail.com)

The progress of sustainable and eco-friendly energy storage and conversion devices has great attention nowadays. Among different energy storage devices supercapacitors (SCs) are attracted tremendous attention due to their novel features such as rapid charging-discharging rate, high power density, long cycle life, and high dynamic of charge propagation. However, due to the relatively lower energy density SCs have limited end applications in comparison to batteries and fuel cells. Therefore, designing asymmetric supercapacitors (ASCs) with aqueous electrolytes has been considered a promising strategy to increase the energy density of SCs. Electrode materials are one of the most important components in SCs and the overall performance of SCs very much depends on the active electrode material used. Carbon-based materials, especially graphene is a promising electrode material due to their excellent conductivity, large surface area, long-term stability and great processing flexibility. However, some challenges remain with graphene due to its stacking and self-agglomeration behavior. Graphene is often combined with other materials like Transition metal oxides (TMOs), Transition metal sulfides (TMSs), carbon nanotubes (CNT), metal dichalcogenides etc. to form composite so that the agglomeration of graphene nanosheets be hindered. TMSs are regarded as an extensively used electrode material owing to their excellent cycling stability, high energy density, low cost, admirable conductivity and high theoretical specific capacitance. To overcome the restacking tendency of graphene it is combined with different TMS nanomaterials with synergistic effects leading to enhance electrochemical performance. In this work, we report the ultrafast microwave-assisted synthesis of reduced graphene-zinc cobalt sulfide composite. The synthetic procedure takes significantly lesser time than conventional methods and is hence benign both environmentally as well as economically. The synthesized composites show enhanced electrochemical performance due to the synergistic effect between graphene and zinc cobalt sulfide nanoparticles. The ASC fabricated with these electrodes exhibits superior performance with high energy and power density and have excellent cycling performance.

**Key words:** Supercapacitor, flexibility, Fabrication, Nanocomposite.