PREPARATION OF HIGH CAPACITANCE NITROGEN DOPED GRAPHENE FROM GRAPHENE OXIDE DERIVED FROM SRI LANKAN VEIN GRAPHITE

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Supercapacitors have attracted significant attention due to their high-power density and rapid charge/discharge capabilities, enabled by the formation of an electrical double layer on large surface area electrodes. This study investigates the synthesis and characterization of Nitrogen-doped Graphene Oxide (NGO) as an electrode material for supercapacitors. Nitrogen doping modifies the electronic structure and density of states in graphene, resulting in increased charge carrier density. The research aims to mitigate graphene sheet stacking and agglomeration issues while achieving higher specific surface areas and capacitance levels. Commercially available graphene oxide (GO) was utilized as the starting material to obtain activated graphene oxide (AGO). AGO was thermally annealed separately using different ratios of Ammonia and Urea as nitrogen precursors. Synthesized N-Ammonia-AGO and N-Urea-AGO were characterized using physicochemical techniques including SEM, EDAX and FTIR spectroscopy and electrochemical characterization testing. The SEM analysis showed reduced stacking in the NGO samples, as evidenced by a layered structure with increased interlayer spacing. FTIR analysis confirmed successful nitrogen doping into the graphene sp^2 network, while the EDAX results show the presence of nitrogen content in the samples after an increased ratio of nitrogen precursor material with AGO. The investigation revealed that both N-Ammonia-AGO and N-Urea-AGO exhibited enhanced specific capacitance compared to AGO and the highest specific capacitance of 180 Fg^{-1} was obtained for N-Ammonia-AGO (1:15 w/w). These findings contribute significant insights into the higher energy storage capabilities of the NGO samples.

Keywords: Supercapacitors, Nitrogen-Doped Graphene, Electrical Double Layer