GREEN SYNTHESIS OF NiO-SnO_2 NANOCOMPOSITE USING FRUIT EXTRACT OF *KIGELIA AFRICANA* (LAM.) BENTH. AND EVALUATION OF ITS ELECTROCHEMICAL PERFORMANCE AS ELECTRODE MATERIAL FOR SUPERCAPACITORS

Usha Rani N.[a]*, Ramanjaneyulu Kongara[b], Pavani P.[a] and Tulasi S. L.[a]

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ABSTRACT

This study presents an eco-friendly approach for synthesizing NiO-SnO_2 nanocomposites utilizing the fruit extract of the medicinal plant *Kigelia africana* (Lam.) Benth. The synthesized material exhibits maximum absorption wavelength at 304 nm and band gap of 3.03 eV, indicating its potential for high electrical conductivity. FT-IR confirms the involvement of plant-derived chemical constituents in the nanocomposite formation, while SEM reveals uniform particle distribution with average size of 19 nm. XRD analysis suggests tetragonal geometry of nanocomposite, while EDX confirms its high purity. Electrochemical studies demonstrate exceptional capacitive properties, with 453 F g^{-1} of specific capacitance at 5 mV s^{-1} scan rate. Complex impedance spectroscopy reveals efficient electrical conductivity, with best solution resistance. Long-term cycling tests over 1,000 cycles confirm both stability and durability of nanocomposite, with retained capacitance of approximately 419.34 F g^{-1}. These findings underscore the potential of NiO-SnO_2 nanocomposites as promising candidates for commercial supercapacitor applications, highlighting their suitability for advanced energy storage solutions.