

# **Synthesis and Characterization of Biodegradable Gelatin Based Carbon Nanotube Composites for Energy Storage Applications**

## **ABSTRACT**

In this study, Gelatin/Multi Walled Carbon Nanotube (Gel/MWCNT), and Gelatin/Single Walled Carbon Nanotube (Gel/SWCNT) nanocomposites with different concentrations of CNTs were prepared by a facile solution casting process. FESEM and FTIR analysis showed an increased interaction between the CNTs and the polymer. The contact angle measurement showed transition from hydrophilic to hydrophobic nature of the composite due to addition of CNTs. Specific capacitance as high as 12.7 F/g at a current density of 0.3 mA/g together with excellent cyclic stability and capacitance retention were obtained for the nanocomposite. From the equivalent circuit analysis of the Nyquist plot showed a decrease in charge-transfer resistance, and an increase double layer capacitance and pseudocapacitance due to incorporation of CNTs resulting in an improved capacitive performance. Incorporation of CNTs was also found to improve the dielectric performance of the nanocomposite. The mechanism behind the improvement of the dielectric performance of the Gel/CNT nanocomposites was also elucidated. The biodegradability of the nanocomposites was also inspected through a self-designed real-world test. The Gel/CNT nanocomposites with improved dielectric performance and specific capacitance synthesized by a simple, low-cost process will pave a way to the production of sustainable, bio-friendly flexible energy storage devices.