Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Seminar

Sono-exfoliated graphene-like activated carbon from hazelnut shells for flexible supercapacitors

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Currently, more than 80% of commercial supercapacitors utilise chemically synthesised expensive carbon nanomaterials that require non-renewable resources for synthesis. Employing renewable, environment friendly and naturally available waste biomass feedstock as precursor for producing carbon materials is a low-cost and sustainable approach for designing the electrodes of supercapacitors. In the present talk, I will discuss about the high surface area hierarchical porous multilayered graphene-like carbon that we obtain via room temperature sono-exfoliation of the activated carbon synthesised via simple and environmentally friendly hydrothermal carbonisation and potassium bicarbonate activation of waste hazelnut shells as the precursor. The high surface area graphene-like carbon showed excellent electrochemical performance with specific capacitance of 320.9 Fg^{-1} at 0.2 Ag^{-1} current density and exceptional capacitance retention of 77.8% at 2 Ag^{-1} current density after 10000 cycles in 1 M Na_2SO_4 electrolyte. Moreover, flexible supercapacitors fabricated using sono-exfoliated graphene-like activated carbon coated stainless steel mesh electrodes and biopolymer gel electrolyte exhibits an outstanding energy density of 38.7 $Whkg^{-1}$ and power density of 198.4 Wkg^{-1}. These results show that mechanically exfoliated graphene-like activated carbon derived from hazelnut shells exhibit superior electrochemical performance that can compete with other activated carbon materials used in energy storage devices for real time applications.

References:

R. Kiran Kumar Reddy, et al. International Journal of Energy Research, July 2022 (in-press).

Tuesday, July 26th 2022

04:00 PM (Tea/Coffee at 3:45 PM)

Auditorium, TIFR-H