Advancements in Supercapacitor Technology: Optimizing Graphene-Enhanced Carbon Materials for Printed Supercapacitor Applications

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Supercapacitors (SCs) have emerged as critical energy storage devices, ideal for Internet of Things (IoT) devices, Artificial Intelligence (AI) applications, and various low-power uses such as energy-autonomous wearable electronics and self-powered wireless sensor networks [1]. This study presents the synthesis of four distinct carbon materials of varying sizes and types through a thermal carbonization process. These materials were subsequently refined to achieve a uniform particle size distribution.

Our development of activated carbons (ACs) for electrode materials involved iterative refinement based on structural, morphological, and electrochemical analyses, with optimization aimed at maximizing graphene content. Raman spectroscopy confirmed the presence of two-dimensional graphene-like structures in the synthesized carbons, evidenced by the appearance of the G' peak.

Finally, printed SCs fabricated using these four AC materials exhibited significantly enhanced specific capacitance and energy density compared to commercial counterparts, highlighting the efficacy of our approach. Join us to explore the advancements in SC technology and their potential applications in modern electronics.

Reference

[1] Naeem, Sajid, Abid Ali, Khalid Memon, Mohammed Bavluwala, U. P. Shinde, and A. V. Patil. "A review of flexible high-performance supercapacitors for the internet of things (IoT) and artificial intelligence (ai) applications." Energy and Thermofluids Engineering 3 (2023): 1-9.