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Graphene-based hydrogel electrolyte for supercapacitors

Recent research has highlighted supercapacitors as promising candidates for energy storage applications due to their unique combination of rapid charge-discharge characteristics, low weight, flexibility, portability, and exceptional power density. These advantageous characteristics have facilitated their integration into emerging technologies within the aerospace sector, electric vehicles, and wearable electronics. However, specific applications often necessitate additional functionalities beyond energy storage, such as robust load-bearing capability, exceptional thermal stability, and enhanced corrosion resistance. To achieve this synergistic effect of simultaneous structural integrity and efficient energy storage, meticulous electrode and electrolyte materials selection is essential. In this regard, the utilization of solid or gel polymer electrolytes represents a highly promising approach for the development of high-performance supercapacitors. Graphene derivatives are particularly attractive because they provide exceptional mechanical reinforcement at the nanocomposite level while maintaining fast charge transport properties. This study investigates the implementation of gel electrolytes formulated with polyvinyl alcohol (PVA), and graphene derivatives possessing varying degrees of oxidation. These electrolytes were characterized using thermal and electrochemical techniques to elucidate the impact of incorporating graphene derivatives. These results will help to establish supercapacitor devices that achieve an optimal balance between mechanical properties and efficient energy storage capability.

Keywords

supercapacitors, graphene, electrolyte, PVA, gel

Reference

Xu, Jiaming, and Dong Zhang. “Multifunctional structural supercapacitor based on graphene and geopolymer.” Electrochimica Acta 224 (2017): 105-112. DOI: 10.1016/j.electacta.2016.12.045

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