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Porous graphene aerogel composite supercapacitors

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Graphene sheets derived from electrochemical exfoliation have shown more pristine qualities such as better electrical properties than those derived from reduced graphene oxide (rGO). In this work, we developed porous 3D structures using graphene obtained via electrochemical exfoliation and explored their application as supercapacitor electrodes. By adjusting the content of the electrolyte in the exfoliation process, the aspect ratio of graphene sheets and the porosity of the graphene network can be optimized. Furthermore, the freezing temperature in the freeze drying step was also found to play a critical role in the resulting pore size distributions of the porous networks. The optimized conditions lead to meso- and macro-porous graphene aerogels with high surface area, extremely low densities and superior electrical properties. As a result, we have found that the graphene aerogel supercapacitors exhibit a specific capacitance of 325 F/g at 1 A/g and an energy density of 45 Wh/kg in 0.5 M H_2SO_4 aqueous electrolyte with high electrochemical stability required for the practical usage. This research provides a practical method for lightweight, high-performance and low-cost materials in the effective use of energy storage systems.

Biography

Hyun Young Jung is now an Assistant Professor in the Department of Energy Engineering at the Gyeongnam National University of Science and Technology in Korea. His ongoing researches focus on energy conversion and storage devices of engineered nanomaterials and composites, aerogel for energy and environment, and optoelectronics. He has published more than 33 papers in reputed journals.

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