Ultrasound-Assisted Formation of rGO/CNF Nanocomposite for Supercapacitor Applications

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Abstract

Electrodes of carbon-based nanocomposites with high specific surface area and suitable pore sizes have attracted great attention to enhance power and energy densities of supercapacitors [1-3]. In this study, we demonstrated that the ultrasound-assisted dispersion of reduced graphene oxide (rGO) into electrospun carbon nanofiber (CNF) could be used as electrodes for supercapacitor applications. The incorporation of rGO into the CNF matrix can prevent not only the agglomeration of graphene sheets but also it improves the electrolyte-electrode accessibility and increases the capacitance of pure CNF. However, the specific capacitance of the nanocomposite could strongly be affected by the mass ratio of rGO/CNFs. Therefore, in order to evaluate the electrochemical performance, the cyclic voltammogram (CV) of the as-synthesized rGO/CNF nanocomposite was measured between 0-1V in 1M H_2SO_4 solution with a three-electrode system. Fig. 1 displays the CV curves for 10% wt addition of rGO into CNF matrix and it was found that the rGO/CNF nanocomposite's specific capacitance (265 F/g) was much higher than those of pure CNF, which is 81F/g. The enhanced electrochemical performance of the rGO/CNF nanocomposite is due to the synergistic effect among components which facilitates the electron transfer and ion transport as well as increases the specific surface area.

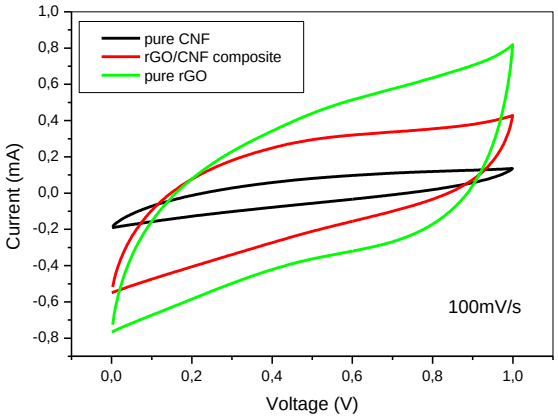

Figure 1: CV curve of hybrid rGO/CNF nanocomposite.

As a result, the well interaction between the components would result in presenting potential energy storage applications of rGO/CNF nanocomposite.

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References

[1] Yang W., Chen Y, Wang J., Peng T., Xu J, Yang B., Tang K, Nanoscale Research Letters,13, 181, 2018.
[2] Yu D, Goh K, Wang Het al. Scalable synthesis of hierarchically structured carbon nanotube–graphene fibres for capacitive energy storage. Nat Nanotechnol, 9, 555–62, 2014.
[3] Wu Y, Liu S, Zhao Ket al. Facile synthesis of 3D graphene hydrogel/carbon nanofibers composites for supercapacitor electrode. ECS Solid State Letters 4, M23–5, 2015.