Electrochemical Properties of Cellulose-nano-fiber/Reduced graphene oxide/Carbon-nano-tube Aerogel

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Using the environmentally cellulose-nano-fiber as the precursor, we prepared a CNF/RGO/MWNT aerogel electrode material via mechanical blending and freeze-drying methods. The effect of RGO/MWNT content on the performance of the aerogel electrode was studied. The structure of the material was characterized with XPS and XRD. The electrochemical performance was characterized with an electrochemical workstation. The morphology was characterized by SEM. The results show that the CNF/RGO/MWNT aerogel electrode possessed good charge and discharge properties, and the specific capacitance increased firstly and then decreased with the increase the content of RGO. The internal resistance of the electrode material decreased with the increase of MWNT content. At a CNF/RGO/MWNT ratio of 30/40/30 and current density of $1 \text{ A} \cdot \text{g}^{-1}$, the specific capacitance reached a maximum of $88.08 \text{ F} \cdot \text{g}^{-1}$. After 1000 charge–discharge cycles, the capacitance retention rate was 95.4%, reflecting great stability. SEM results show that CNF was effectively incorporated into RGO/MWNT. The CNF/RGO/MWNT aerogel has a highly-connected three-dimensional porous network structure.

Keywords: cellulose-nano-fiber, graphene oxide, carbon-nano-tube, aerogel

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