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**Lignin-based hierarchical porous carbon nanofiber films with
superior performance in supercapacitors**

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Abstract

Lignin, a renewable resource, has been used as carbon precursor to prepare porous carbon nanofiber films by electrospinning with PVP as spinning agent and $\text{Mg}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ as additive. The effect of the content of $\text{Mg}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ on the morphology, microstructure, surface chemistry, specific surface area and porous structure of the lignin-based porous carbon nanofiber films (LCNFs) is investigated. Results show that with the increase of the content of $\text{Mg}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ in the spinning solution, the average diameter of fibers is decreased obviously, while specific surface area and mesoporosity are increased significantly. When mass ratio of $\text{Mg}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ /lignin is 2: 1, the resultant LCNFs possessed an increased specific surface area of $1140 \text{ m}^2 \text{ g}^{-1}$ and a significantly improved mesoporosity of 78%, and showed hierarchical porous structure. LCNFs were cut into electrode for supercapacitors directly and were evaluated in three-electrode and two-electrode cell. With increase of $\text{Mg}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$, the capacitive performance of LCNFs turn better. When mass ratio of $\text{Mg}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ /lignin was 2: 1, the specific capacitance of LCNFs reached 248 F g^{-1}

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