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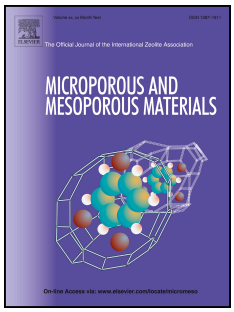

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Preparing hierarchical porous carbon aerogels based on enzymatic hydrolysis lignin through ambient drying for supercapacitor electrodes

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ABSRTRACT

Hierarchical porous lignin-based carbon aerogels, synthesized through a low-cost and simple method, are promising for applications in supercapacitor electrodes. Lignin-based carbon aerogels are prepared by pyrolysis and KOH activation of lignin-based aerogels. Lignin-based aerogels are prepared by mixing of enzymatic hydrolysis lignin (L), resorcinol (R) and formaldehyde (F) under the catalysis of Na_2CO_3 (C) followed by gelation, aging and ambient drying process. The results show that lignin-based carbon aerogels with a L/(L+R) ratio of 20%, exhibit a high specific surface area of 779 m^2/g, a large total pore volume of 0.48 cm^3/g, and a large micropore volume of 0.29 cm^3/g. The obtained lignin-based carbon aerogels exhibit an interconnected, hierarchical porous network structure and a high degree of graphitization, which further contributes to their excellent electrochemical performance as electrodes in supercapacitors. The specific capacitance reaches 142.8 F/g at a current density of 0.5 A/g. Even at a large current density of 10 A/g, the specific capacitance of the CA-L20 electrode remains 112.5 F/g. After 2000 charge/discharge cycles, the specific capacitance still maintains 96% of its initial value, which indicates an excellent durability.

Keywords: Enzymatic hydrolysis lignin; Carbon aerogels; Ambient drying; Hierarchical porous

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