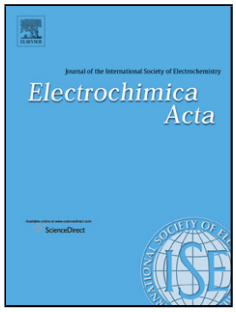

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Nitrogen and Oxygen-Doped Hierarchical Porous Carbons from Algae Biomass: Direct Carbonization and Excellent Electrochemical Properties

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Abstract:

Herein, the algae pollutants of *Enteromorpha prolifera* were applied as precursors to obtain nitrogen and oxygen co-doped hierarchical carbons with major pores at around 1.5 and 5.0 nm through direct carbonization at 700 and 900 ºC after freeze-drying treatment. Physical properties of porous carbons including morphology, elemental analysis, and pore size distribution were evaluate by transmission electron microscopy, X-ray photoelectron spectroscopy and N_2 sorption. In both cases, surface areas were only close to 450 $m^2 g^{-1}$ with 70% areas inherited from mesopores, resulting in high density materials. The carbon derived at 700 ºC had the highest capacitance of 234 F g^{-1} at a current density of 0.5 A g^{-1} in 6M KOH electrolyte and also had excellent cycling stability with 95% of capacitance after 2000 cycles, owing to the naturally heteroatoms and unique hierarchical nanopores contributed pseudo-capacitance and provided active sites for facilitating electrolyte ions diffusion. In addition, the carbon derived at 900 ºC had CO_2 uptake of 6.48 mmol g^{-1} at 20 bar and 25 ºC.