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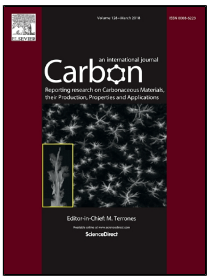

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Nitrogen-containing novolac-derived carbon beads as electrode material for supercapacitors

Benjamin Krüner,[1,2] Anna Schreiber,[1] Aura Tolosa,[1,2] Antje Quade,[3] Felix Badaczewski,[4] Torben Pfaff,[4] Bernd M. Smarsly,[4] Volker Presser[1,2,*]

[1] *INM - Leibniz Institute for New Materials, Campus D2 2, 66123 Saarbrücken, Germany*

[2] *Department of Materials Science and Engineering, Saarland University, Campus D2 2, 66123 Saarbrücken, Germany*

[3] *Leibniz Institute for Plasma Science and Technology, Felix-Hausdorff-Straße 2, 17489 Greifswald, Germany*

[4] *Institute of Physical Chemistry, Justus-Liebig University Giessen, Heinrich-Buff-Ring 58, 35392 Giessen, Germany*

* *Corresponding author. E-mail: volker.presser@leibniz-inm.de*

Abstract

Nitrogen-doped porous carbon materials are interesting for energy storage via supercapacitors because they may improve the performance. We pyrolyzed and activated novolac beads in one single step with ammonia at different temperatures (750-950 °C), which leads to a highly porous carbon with nitrogen-doping. The chemical and physical properties were characterized and correlated with the electrochemical performance as supercapacitor electrodes. The average pore size varied at 0.6-1.4 nm due to the different synthesis temperatures, which allows to study steric hindrance effects of ions during electrosorption. Three different electrolytes (aqueous, organic, and ionic liquid) were tested. The specific capacitance in a symmetrical supercapacitor ranged up to 173 $F \cdot g^{-1}$ and was strongly dependent on the porosity of the electrode material and the kind of electrolyte. We found that the presence of nitrogen group enhances the stability of a supercapacitor and led to a high specific energy of 50 $Wh \cdot kg^{-1}$ with ionic liquid as electrolyte.

Keywords:

porous carbon; nitrogen-doping; supercapacitor; electrochemical energy storage