ELECTROCHEMICAL PERFORMANCES OF NITROGEN-DOPED MESOPOROUS CARBONS DERIVED FROM TANNIN

Jimena Castro-Gutiérrez[1]*, María Teresa Izquierdo[2], Jaafar Ghanbaja[3], Alain Celzard[1], Vanessa Fierro[1]

[1]*Institut Jean Lamour, UMR 7198 CNRS and Université de Lorraine, Épinal, France*
[2]*Instituto de Carboquímica, ICB-CSIC, Miguel Luesma Castan, 4, 50018 Zaragoza, Spain*
[3]*Institut Jean Lamour, UMR 7198 CNRS and Université de Lorraine, Nancy, France*

* Presenting author's e-mail: jimena.castro-gutierrez@univ-lorraine.fr

Supercapacitor devices store energy through the interaction of electrolyte ions with the surface of a carbon material, resulting in the formation of an electric double layer (EDL). The EDL mechanism leads to high power outputs but with low energy densities in comparison with batteries. Among the strategies to improve supercapacitors performances, the modification of the surface chemistry is frequently used. The introduction of heteroatoms on the carbon materials surface can enhance the electrical conductivity and/or the affinity towards the electrolyte, in addition to enabling redox reactions that provide a pseudocapacitance contribution, thus further increasing the amount of energy stored by the device.

Herein, ordered mesoporous carbons (OMCs) were synthesized by a surfactant- and water-assisted mechanochemical mesostructuration (SWAMM) method using mimosa tannin as carbon precursor. Nitrogen doping was carried out by two routes: (i) direct physical mixing of urea and OMC, followed by a thermal treatment; and (ii) CO_2 activation of the OMC and then mixing the resultant activated material with, again followed by a thermal treatment. For the sake of comparison, N-doping of a disordered mesoporous carbon (DMC), also synthesized by the SWAMM method, was carried out through route (i). Different urea:carbon weight ratios were used, and the effect on the textural and surface chemistry properties was investigated. Finally, samples with adequate properties were selected to be tested as electrodes for supercapacitors; the influence of the textural and surface chemistry properties on the electrochemical performances was studied.

Preferred participation: Poster presentation