ACTIVATED MESOPOROUS CARBONS DERIVED FROM TANNIN AS ELECTRODES FOR SUPERCAPACITORS

Jimena Castro-Gutiérrez[1]*, Noel Díez[2], Marta Sevilla[2], María Teresa Izquierdo[3], Jaafar Ghanbaja[4], Alain Celzard[1], Vanessa Fierro[1]

[1]*Institut Jean Lamour, UMR 7198 CNRS and Université de Lorraine, Épinal, France*
[2]*Instituto Nacional del Carbón (CSIC), P.O. Box 73, Oviedo, 33080, Spain*
[3]*Instituto de Carboquímica, ICB-CSIC, Miguel Luesma Castan, 4, 50018 Zaragoza, Spain*
[4]*Institut Jean Lamour, UMR 7198 CNRS and Université de Lorraine, Nancy, France*

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

An easy and green one-pot synthesis method was developed to produce mesoporous carbons through ball milling of mimosa tannin (T), Pluronic® F127 (P) and water (W) without the use of crosslinkers. The effect of key parameters such as milling time, pH of added water and P:W weight ratio was studied; it was found that it was possible to obtain either ordered or disordered mesoporous carbons (OMCs or DMCs, respectively) by changing the P:W ratio.

CO_2 activation on selected OMCs and DMCs allowed improving the textural properties, i.e., surface area, micro and mesoporous volume and pore connectivity. CO_2 activation was more effective on DMCs as shorter activation times were needed. The easier development of textural properties in the case of DMCs might be due to the higher residence time of CO_2 in the particle since the carbon texture, determined by Raman, and the heteroatoms content on the surface were identical.

Furthermore, to study the impact of the mesoporous ordering on the electrochemical performances, two activated carbons with similar textural properties were chosen out of each series of OMC and DMC materials; the electrochemical characterization was carried out in aqueous and organic electrolytes. Results showed that the activated carbons derived from OMC (AOMC) had a better response in aqueous electrolyte while the DMC-derived material (ADMC) outperformed the AOMC in organic electrolyte. In both electrolytes, high rate capability and long-term stability were achieved by both AOMC and ADMC.