4th International Conference on

MATERIALS SCIENCE & ENGINEERING

June 26-27, 2019 | Paris, France

Hydrolysable tannins a new raw material for carbon materials synthesis

Vanessa Fierro, Pamela Ramirez-Vidal, Jose Eduardo Monsivais Rocha and **Alain Celzard**
Universite de Lorraine, France

Tara tannins (TT) are hydrolysable tannins, requiring aldehydes to form resins. They are generally used to treat leather, but other higher added-value applications are possible. In this study, we used TT as precursor of mesoporous materials by mixing with Pluronic F127 and various aldehydes, which increased the carbon yield but reduced the textural characteristics of the resultant carbons. However, blending Tara tannin together with Mimosa tannin (MT), Pluronic F127 and water allowed obtained highly microporous-mesoporous materials without using any aldehyde. We followed three approaches for the synthesis of mesoporous carbons: We mixed TT, Pluronic F127 (P) and 37.1 wt. % formaldehyde (F) solution in a PM100 (RESTCH) planetary ball miller for 1h with different P/TT and F/TT weight ratios. When TT was directly submitted to pyrolysis, the resultant carbon was purely microporous and had limited texture development, the BET areas (ABET) was only 111 m2/g while those materials including P and F were micro-mesoporous. F addition improved the mesostructuration but reduced ABET. F addition also increased the carbon yield from 20 (0 g) to 45% (2g). P addition increased the mesoporous and total pore volumes while microporous volumes remaining unchanged. The mesoporous carbons had ABET values ranging from 212 to 536 m2/g. We used different aldehydes instead of using F in order to have a greener synthesis approach: 97 wt. % furfural (Fur), 40 wt. % glyoxal (G) or 50 wt. % glutaraldehyde (GA) solutions. Mechanical mixing was applied as described above. When using TT with GA, Fur or G, higher ABET than that determined when using F were obtained, but the carbon yields were also lower that those obtained with F. A good compromise was obtained with Fur, which led to ABET of 836 m2/g and to a carbon yield of 20.6%, compared to 362 m2/g and 40.1%, respectively, when using F. We mixed TT with MT, in different weight ratios, and with P and water (W). The total amount of tannin (T) was kept to 2 g, whereas P and W were set to 0.75 and 1.75 g, respectively. Mechanical mixing was applied as described above. When mixing TT with MT, carbon yield, linearly decreased, from 50.3 to 22.2% indicating that there is no interaction between TT and MT. Adding TT also induced disorder but the mesopore volume progressively increased to a maximum obtained for equal amounts of TT and MT, 1 g of each. This approach is the greenest of the three presented here because it allowed mesostructuration of the final carbon material without using any aldehyde.

Biography

Vanessa Fierro pursued doctoral researches at the Institute of Carbochemistry (ICB-CSIC) and obtained her PhD from Zaragoza University (Spain). After working several years as a researcher at French Institute of Petroleum, at the Institute of Research on Catalysis and the Environment of Lyon (France) then at the Chemical Engineering School of Tarragona (Spain), she is a CNRS Research Director as well as a member of the Technical Group Coal 2 of the Research Fund for Coal and Steel (RFCS). She currently works at Institut Jean Lamour (France), a joint University of Lorraine-CNRS laboratory, where she leads the Bio-sourced Materials Research Team. Vanessa has more than 250 scientific publications, an h-index of 48 and an extensive background in the area of porous carbon materials for energy and environmental applications.

Vanessa.Fierro@univ-lorraine.fr