DESIGN OF POROUS CARBONACEOUS MATERIALS AS EFFICIENT SUPPORT FOR COPPER-BASED/C COMPOSITES

Adela-Maria Spinciu[a], Florina Dumitru[b], Daniela C. Culita[a], Silviu Preda[a], Jose Calderon-Moreno[a], Elena-Maria Anghel[a], Simona Petrescu[a], and Diana Visinescu[a]

[a] "Ilie Murgulescu" Institute of Physical Chemistry, Romanian Academy, Bucharest, Romania
[b] University Politehnica of Bucharest, Faculty of Chemical Engineering and Biotechnologies, Bucharest, Romania

Porous carbons are versatile materials that have been extensively studied due to their unique physico-chemical features such as high specific surface area, large pore volumes, good electrical conductivity, and high thermal and mechanical stability [1]. Moreover, they can be readily synthesized from a wide range of low-cost and eco-friendly precursors and tailored to suit the specific demands of various applications. In order to achieve uniform and ordered porosity in carbon-based materials, different templating strategies, usually classified as hard and soft-template methods, can be used. Herein we report on the synthesis and characterization of new porous carbonaceous materials using mono- or polysaccharides as C sources (glucose, chitosan, and carrageenan) by employing both templating methods. The hard-template method is multi-stepped and consists of: the synthesis of the mesoporous silica MCM-41/SBA-15 as inorganic sacrificial hard templates, the introduction of the carbohydrates into the template pores, cross-linking and carbonization of the carbon precursor to generate an organic-inorganic composite and selective removal of the silica-based scaffold to yield porous carbonaceous materials. For the soft template method, the carbohydrates were mixed with block copolymers that act as soft templates, followed by hydrothermal carbonization at a moderate temperature under self-generated pressures. Furthermore, to improve the surface area and pore size distribution, the obtained carbonaceous materials were heated at high temperatures in a low-oxygen environment, using the double crucible method [2]. The post-synthesis impregnation of the as-obtained porous carbon-based materials with copper particles afforded copper-based/C composites. The optical, morpho-structural, and textural properties of the carbonaceous matrix and of the corresponding copper-containing composites will be discussed.

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[1] N. Diez, Marta S., A. B. Fuertes, *Synthesis strategies of templated porous carbons beyond the silica nanocasting technique*, Carbon, 2021, 178, 451-476.

[2] Md. Ahiduzzaman, A.K.M. Sadrul Islam, *Preparation of porous bio-char and activated carbon from rice husk by leaching ash and chemical activation*, SpingerPlus, 2016, 5, 1248.