Acid-chars as platform materials for adsorption and catalysis

Ana P. Carvalho[a]*, Tiago A.G. Duarte[a,b], Tetiana Hubetska[a,c], Sandrine Tschirren[a], Carla Nunes[a], José R. García[c], Luísa M.D.R.S. Martins[b], Ana S. Mestre[a]

[a] *Centro de Química e Bioquímica and Centro de Química Estrutural, Faculdade de Ciências, Universidade de Lisboa, 1749-016 Lisboa, Portugal*

[b] *Centro de Química Estrutural, Instituto Superior Técnico, Universidade de Lisboa, Av. Rovisco Pais, 1049-001 Lisboa, Portugal*

[c] *Departamento de Química Orgánica e Inorgánica, Universidad de Oviedo, Spain*

*Corresponding author: ana.carvalho@fc.ul.pt

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The research on the potentialities of carbon materials based on renewable biomass sources has been greatly driven by the need of developing more sustainable processes and technologies. Among the processes available to obtain carbon functional materials, acid-mediated carbonization has been far less explored than conventional thermal or hydrothermal carbonization, but the resulting acid-chars, plenty of oxygen reactive functional groups, can compete with hydrochars or biochars in several processes. In the present communication recent data obtained in our research group on the synthesis and application of acid-chars from various biomass precursors in adsorption and catalytic processes will be presented.

Sisal-derived acid-chars were successfully used as precursors of superactivated carbons with BET area reaching 2000 m^2/g. The control of H_2SO_4 concentration during the acid-chars synthesis and proper selection of activation method (chemical or steam) allowed to obtain materials with distinct pore size distributions (microporous or micro-mesoporous) and densities. The samples were tested as adsorbents of pharmaceuticals ibuprofen and iopamidol outperforming the results of commercial golden standards.

Preliminary data also demonstrated the potentialities of the as-synthesised acid-chars as adsorbents (promising results for Cu^{2+}, Cd^{2+} and pharmaceuticals removal from aqueous medium), and catalysts (butanol esterification with acetic acid achieved 64 % conversion after 6 h of contact time).

Acid-chars have been further explored as supports for catalysts by immobilizing a Mo-complex on acid-chars. Olefin epoxidation using the immobilized complex showed conversion close to that achieved by the homogeneous counterpart, even after several re-use cycles.