Mesoporous monoliths from nanoparticle-enhanced naturally-derived biopolymers

CSIC and the University of York have developed a novel class of monolithic mesoporous carbonaceous materials incorporating carbon nanoparticles with controllable functionality. These materials present superior electrical and/or thermal conductivity, electromagnetic adsorption, as well as improved gas and liquid flow characteristics, ideal for applications in the areas of water remediation and EDLC, amongst others.

Industrial partners from the pharmaceutical, chemical, technology and water remediation industries are being sought to collaborate through a patent licence agreement.

An offer for Patent Licensing

A Shaped Sustainable Mesoporous Material

Technology to produce carbonaceous materials with high mesoporosity combined with controllable surface functionalization and the ability to be shaped into designed forms is currently limited. To obtain materials with a high carbon:oxygen ratio very high temperatures > 1500 °C are needed, resulting in elevated costs due to high energy usage and large mass losses during carbonization.

These materials, jointly developed by the CSIC and York, are made from bio-derived polysaccharides that incorporate carbon nanoparticles, produced by simple expansion of the polysaccharide and carbonization of the materials at significantly lower temperatures than those employed in current technology. Excellent nanoparticle dispersion enhances mechanical, electrical and thermal properties, and shapeable monolithic nanocomposite materials can be obtained with > 85% mesoporosity, total pore volumes > 0.4 ml/g, and electrical conductivities ranging from 255-660 Sm^{-1}.

These new materials are ideal for application in water remediation

Main innovations and advantages

- Powders or monoliths can be prepared, the latter allowing the development of shaped mesoporous materials with good mechanical and dimensional stability.
- Environmentally friendly production, using sustainably sourced starting materials and no toxic or aggressive chemicals. Lower preparation temperatures make manufacture more energy and cost efficient.
- Relatively small nanoparticle loading homogenously dispersed and in intimate contact with the biopolymer dramatically modifies the properties of the mesoporous materials with tuneable pore size distribution.
- Potential applications are envisaged in catalysis, filtration, membrane technology, chromatography, water remediation, and energy storage.

Patent Status

PCT patent application filed

For more information, please contact:

Álvaro González Gómez

Institute of Polymer Science and Technology (ICTP)
Deputy Vice-Presidency for Knowledge Transfer.

Spanish National Research Council (CSIC)

Tel: (+34) 91 561 88 06 (ext. 921513)
E-mail: alggomez@ictp.csic.es

UNIVERSITY of York

MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD

CSIC
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS