Customized 3D porous carbon structures made from sustainable sources

CSIC has developed 3D porous carbon structures from whey powder, a by-product from dairy industry. These structures can be obtained with a millimeter precision using casting or with a micrometric precision using additive manufacturing techniques. These parts are fully customizable in any shape and size. They find a wide range of applications: filters, catalysts support, carbon molecular sieves, scaffolds for tissue engineering, reactors, membranes, filtering or support of enzymes or biomolecules, 3D carbon electrodes.

Industrial partners manufacturers of carbon materials or activated carbons are being sought to collaborate through a patent license agreement.

An offer for Patent Licensing

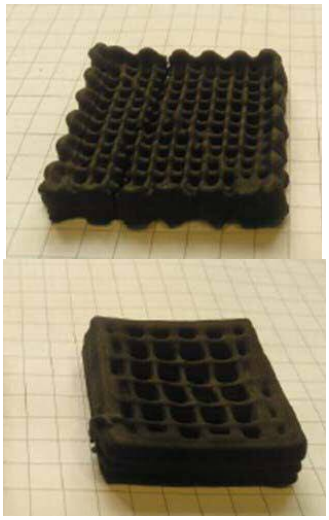
Tailored design with wide variety of sizes and shapes

Scientific researchers of CSIC have developed 3D carbon structures from whey, a bi-product of dairy industry. The process allows to obtain structures by casting or additive manufacturing in a tailored design.

Likewise, porosity and surface properties of these monoliths can be tailored according to the final application. The walls of these carbon structures contain a hierarchical porous network composed by pores from nanometers to microns.

Pieces with up to 3 times higher consistency and 9.2 times lower abrasive wear than commercial monoliths have been successfully produced.

Typical properties of the carbon monoliths	
He-density	≈ 2. g/cm^3
Hg-density	0.85 – 038 g/cm^3
Porosity	60 - 80 %
Max. Pore size	300 µm
S_{BET}	200-2000 m^2/g
Permeability	1 Darcy
Abrasiveness	< 1 wt%
Flexural strength	15-20 MPa
Flexural modulus	6 GPa
Thermal conductivity	< 1 W/(mK)
Electrical resistance	>10^5 µΩm



Parts with a millimeter/micrometric precision can be obtained using casting or additive manufacturing techniques

Main innovations and advantages

- Made from 100% sustainable natural products.
- Scalable at industrial level
- High mechanical strength and high wear resistance.
- Low weight, low density and open porosity.
- Dimensional stability at temperatures up to 900°C.
- Biocompatible material.
- Main uses include: Filters, catalysts support, carbon molecular sieves, scaffolds for tissue engineering, reactors, membranes, filtering or support of enzymes or biomolecules, 3D carbon electrodes, etc.

Patent Status

Priority patent application filed suitable for international extension.

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