A post-functionalizable, sustainable and cost-effective graphene aerogel.

CSIC has developed a simple, eco-friendly and easily scalable method for the production of graphene oxide aerogel (GO). The material obtained contains numerous functional groups susceptible to derivatisation, and presents high stability in air and aqueous medium. The possible applications are focused on membrane technologies, CO_2 adsorption, selective adsorption of gases, supercapacitors and batteries, among others.

Industrial partners are being sought to collaborate through a patent licence agreement.

An offer for Patent Licensing

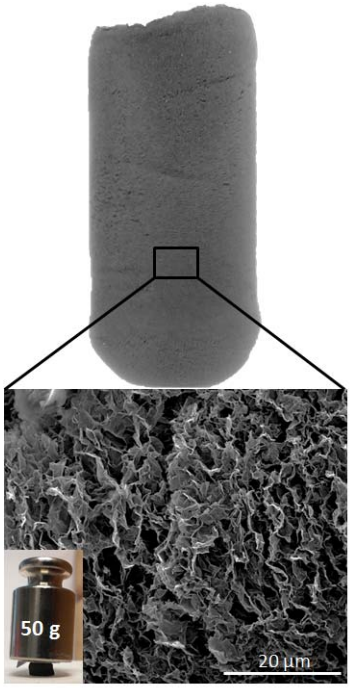
Versatile and highly stable graphene oxide aerogel

Current industrial trends are moving towards the production of graphene and its derivatives for a wide range of applications, and whenever possible, through efficient and sustainable processes.

To date, in the production of graphene oxide aerogels (GO), the use of "green solvents" such as alcohol combined with a drying treatment, seems to be the greenest option available. However, the disadvantages involve the use of very high temperatures (> 500 K), the inherent flammability of the solvent, and the changes in the chemical reactivity of the treated material. As a consequence, the reduction of GO to rGO (reduced graphene oxide) causes the elimination of functional groups and the instability of the material in water.

The present technology proposes a method of producing a GO aerogel starting from an alcohol dispersion of graphene oxide nanoparticles or platelets at room temperature, and subsequently applying a supercritical CO_2 drying process at low temperatures (T <370 K) and mild pressures (P~15-20 MPa). The procedure is developed under isothermal and isobaric conditions, and it is readily reproducible, scalable and cost-effective.

The aerogel obtained combines stability and robustness with a high functionalization capacity granted by the large number of functional groups maintained from the starting graphene oxide. Its chemical composition shows a surprisingly low degree of reduction from GO to rGO, together with a high surface area, between 100 m_2/g and 250 m^2/g, and a high pore volume, between 0.9 and 1.5 mL / g.



Monolith of GO aerogel and SEM micrograph

Main innovations and advantages

- The graphene oxide aerogel obtained is highly functionalizable, stable in air and in aqueous medium, flexible and shows a great capacity of ab(d)sorption.
- Easily scalable method.
- Environmentally sustainable production.
- Cost efficient
- Possible applications as adsorption material in membrane technologies, CO_2 adsorption, selective gas separation, batteries, supercapacitors, metal catalyst supports, among others.

Patent Status

Priority patent application filed suitable for international extension

For more information, please contact:

Virginia Cousté

Parc de Recerca UAB (CSIC–IRTA–UAB)

Tel.: + 34 935868831

E-mail: virginia.couste@uab.cat

MINISTERIO DE CIENCIA, INNOVACIÓN Y UNIVERSIDADES

CSIC
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS