NEW MULTIFUNCTIONAL FOAMED MATERIAL

DESCRIPTION OF THE TECHNOLOGY

The research group "Composite Materials and Metallurgical Processes", which belongs to the Advanced Materials Laboratory of the University of Alicante, has developed a foamed material that comprises a structural matrix, at least one host phase and a fluid.

This foamed material is characterized because the structural matrix comprises a plurality of interconnected porous cavities, the host phase is housed inside at least one porous cavity of the structural matrix and the fluid is housed inside the porous cavity (Figure 1).

The host phase, in finely divided particle or fibre form, is housed within the porous cavity of the structural matrix, and can be:

- without maintaining any bond with it: between the walls of the porous cavity of the foamed material and the surface of the host phase there is a gauge of space that is occupied by the fluid.
- maintaining union with this structural matrix: between the walls of the porous cavity of the foamed material and most of the surface of the host phase there is a space gauge that is occupied by the fluid.

The structural matrix of the foamed material may consist of a material of a metallic, ceramic or polymer nature or mixtures thereof.

The host phase of the foamed material, preferably in a finely divided state (particles or fibres), is a functional material, i.e. any material that confers a certain function, such as, for example, an adsorbent function. These include: carbon, active carbon, organo-metallic skeleton materials (MOFs), etc. The foamed material can be made up of several host phases of a different nature, so that each of them provides a different functionality to the final foamed material.

The fluid inside the porous cavity of the foamed material can be a gas or a liquid. This fluid is found surrounding all or a large part of the host phase(s) in the porous cavity, in such a way that the fluid can circulate through the interior of the foamed material, as it has interconnected porosity, and renew itself if a pressure gradient is imposed at its ends.

The host phase(s) of the foamed material can be housed in all or part of the porous cavities, leaving the host phase free and the rest of the cavities completely occupied by the fluid (Figure 2).

MARKET APPLICATION SECTORS

As stated in the title, this material is useful for multiple applications, highlighting two of them:

- as an **implant material** allowing the growth of living tissue in its interior with the adsorbent host(s), in such a way that it retains at least one substance with pharmacological activity in a living organism, so that this substance is released in a controlled way by desorption from the host phase in the living organism.
- as a **catalyst material** or as a support material for catalysts. The material allows catalytic active materials to be housed in the host phases and ensures that the passage of fluids through it. In addition, this material can be considered multi-catalytic when different host phases are combined, which allow the different catalytic centres to be physically separated.

Apart from those uses, this foamed material can also be used for the following applications: controlled release of chemicals or pharmaceuticals; adsorption of gases, liquids or dissolved solids; filter for inorganic or biological substances; magnetic material; impact absorbing material in passive safety parts of land, air and sea transport vehicles; an electromagnetic radiation absorber material for conversion into heat or electrical energy; radar wave resonator material, applied in radar invisibility technologies; template material for crystalline growth in the gap between the structural matrix and the host phase(s).

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TECHNICAL ADVANTAGES AND BUSINESS BENEFITS

The foamed material described has the following advantages:

- If the structural matrix and the host phase(s) are not joined, both fulfil their functionality independently.
- The matrix phase can be of a material that has good mechanical properties, so that it can withstand mechanical stresses derived from implantology use.
- The host phase(s) can be a material with varied mechanical properties and with a high specific surface area (functional material), so that the material as a whole has a higher surface area and can serve as an adsorbent of chemical substances.

Although, the greatest advantage, without a doubt, is the versatility of this material, since it can be used for multiple business applications.

CURRENT STATE OF DEVELOPMENT

The material has been developed on a laboratory scale, although the infiltration processes are easily scalable.

INTELLECTUAL PROPERTY RIGHTS

This technology is protected by patent, with title "**Foamed materials of pore interconnected with host phases, procedure for the preparation of such materials and uses thereof**", application number **P201730890**, and application date **July 5, 2017**.

COLABORATION SOUGHT

The research group is looking for companies interested in acquiring this technology for commercial exploitation through:

- Patent licensing agreements to assign the rights of use, manufacture or marketing of the technology to third parties.
- R&D project agreements (technical cooperation) for the development of new applications, adapting the technology to the specific needs of the company, etc.
- Subcontracting agreements for technical assistance, training, etc.

RELATED IMAGES

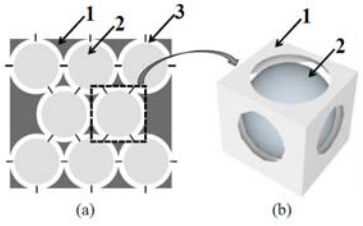

Image 1: interconnection of existing pores.

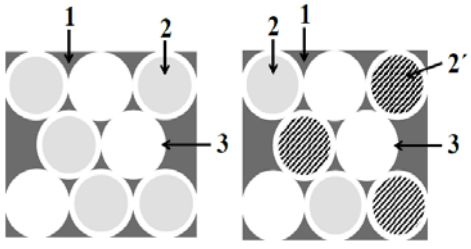

Image 2: Different foamed materials.

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