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VNIVERSITAT DE VALÈNCIA

NEW NANOCOMPOSITES FOR ENERGY STORAGE

DESCRIPTION OF THE INVENTION

Nanocomposite materials for energy storage applications are becoming of great interest due to the properties provided by its various constituents. Among possible nanocomposites that are being currently synthesized, those from layered double hydroxides (LDH) are attracting particular attention, especially carbon and metal oxides nanocomposites. These nanocomposites based on LDH have great potential applications in electrochemical devices such as supercapacitors. However, most new materials investigated turned out to be unfeasible from the commercial standpoint, due to its high cost and complexity of manufacture.

Researchers from Universitat de València have developed new low cost nanocomposite materials with excellent supercapacitive and giant magnetoresistance (GMR) properties. The nanocomposites are obtained through a simple single stage and low temperature process, and from highly available and low cost materials, such as LDH. Nanocomposites are formed by nanoparticles (NPs) of a magnetic metal alloy (eg FeNi3) and a nanostructured carbon matrix.

Furthermore, the NPs can be easily removed in a next step by acid leaching of the hybrid composite, to enable the insulation of freestanding carbon nanoforms, including nano-onions and multi-walled nanotubes. This methodology opens the door for the low-cost and more environmentally friendly synthesis of these new forms of carbon.

BUSINESS APPLICATION SECTORS

Energy: The new nanocomposites are useful for all those devices that require materials with supercapacitive properties. Supercapacitors (or ultracapacitors) are mainly used for energy storage: “energy smoothing” and momentary-load devices, KERS devices used in vehicles, replacing batteries for specific cases, smaller applications like home solar energy systems, etc.

Electronics: On the other hand, due to GMR properties these materials are also useful for spintronics applications, as could be read heads of modern hard drives and magnetic sensors.

Materiales y nanotecnología: Finally, the resulting carbon nanoforms have a wide range of potential applications, from solar cells to batteries or biomedicine, and its study with magnetic, optic and spintronic systems is growing.

TECHNICAL ADVANTAGES AND BENEFITS

The new materials have the following advantages:

- Low cost: obtained by a chemical process of a single stage, with a single precursor, at low temperature, and highly available, non-polluting and low cost materials.
- Supercapacitive properties: specific capacitance values much higher than those obtained by commercial nanostructured carbon electrodes.
- Good cyclability: testing in cyclability is promising in terms of electrochemical and mechanical stability.
- Giant magnetoresistance, GMR: this property is observed at room temperature, and high magnetic fields are not needed.
- Source of carbon nanoforms: based on the nanocomposite, can be obtained a mixture of carbon nanoforms consisting of nano-onions and multi-walled nanotubes.

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DEVELOPMENT STATUS

The technology has been validated in laboratory, and currently the research group is working on its development and scaling.

INTELLECTUAL PROPERTY RIGHTS

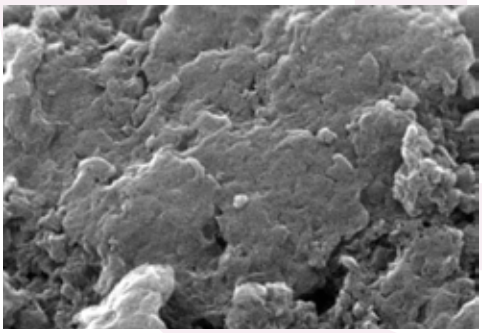
The technology is protected through the following patents:

Spanish patent application P201200188, titled “Nanocomposites de matriz grafitizada y nanopartículas metálicas con propiedades de supercapacitancia y magnetorresistencia”. PCT extension number PCT/ES2013/000050.

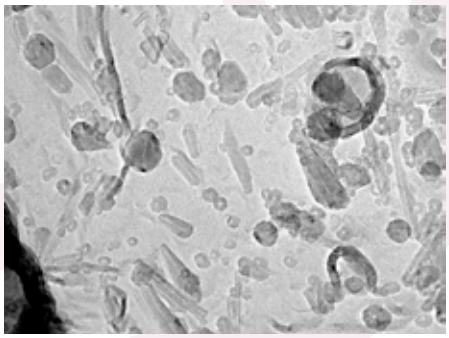
COLLABORATION SOUGHT

- License agreement, manufacturing or marketing.
- R & D project to complete the development or apply to other sectors.
- Subcontracting agreement with another company.
- Possible spin-off (looking for partners)

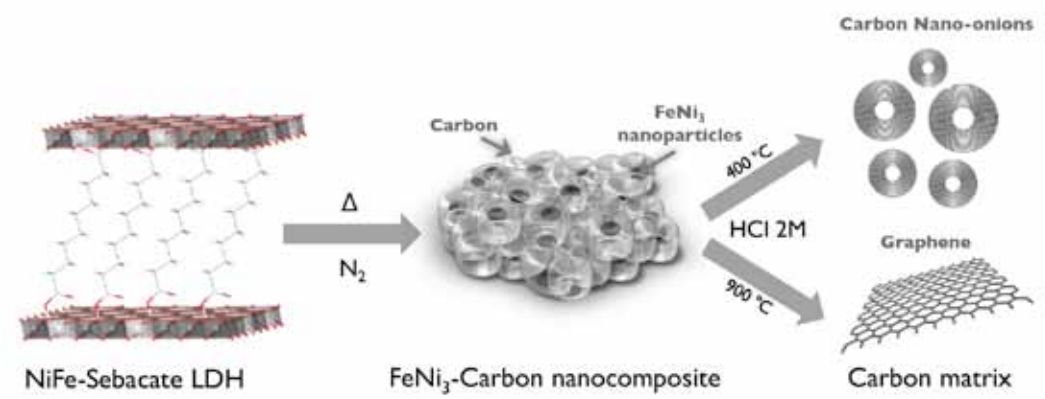
RELATED IMAGES



Scanning Electron Microscopy (SEM) of the nanocomposite.



High Resolution Transmission Electron Microscopy (HRTEM) of the nanocomposite



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