Magnesium/polymer composite biomaterial for biomedical applications

Biocompatible and resorbable composite made of polymer matrix and particles of magnesium, useful for the manufacture of biomedical devices and implants for bone repair and/or regeneration.

Description and essential characteristics

The technology consists of a biocompatible, resorbable and biodegradable material made of a mixture based on a biocompatible and biodegradable copolymer that contains polylactic acid (PLA) and particles of magnesium (Mg).

The particle size of Mg used for the manufacture of the composite is selected depending on its application. Particle sizes lower than 50 microns are used for osteosynthesis applications (bone repair), whereas particle sizes between 50 and 250 microns are required for tissue engineering approaches (bone regeneration).

The method for obtaining the biomaterial consists of the following steps:

a) Mixing the matrix-forming polymer and magnesium particles with an organic solvent that facilitates the dispersion of the magnesium particles in the polymeric matrix.

b) Evaporation of the organic solvent from the product obtained in step (a).

c) Thermomechanical processing to compact and shape the product obtained in step (b) at specific temperature ranges.

Competitive advantages

Mg/polymer composite exhibits superior mechanical properties (strength, elastic modulus) to those of dense or porous resorbable polymers. The PLA used for the manufacture of the composite will depend on its application, using semicrystalline forms (L-PLA) when higher mechanical performance (or a longer degradation period) is required, or amorphous forms (DL-PLA) if the application involves lower mechanical loading (or shorter resorption times). Copolymers could also be used to modulate both mechanical properties and degradation rates.

The advantages of using Mg include its biocompatibility and its osteoconductive properties. Furthermore, the ions released during its degradation are soluble in physiological media and are readily excreted in urine. Reinforcement of the polymer with Mg improves the mechanical properties of the composite, which are similar to those of human bone, thus favouring the load transfer at the bone/material interface.

Additionally, the use of a completely biodegradable material provides important advantages in relation to the use of conventional metal alloys, such as elimination of the stress shielding effect and the possibility of post-operative diagnosis using electromagnetic fields.

Type of collaboration sought

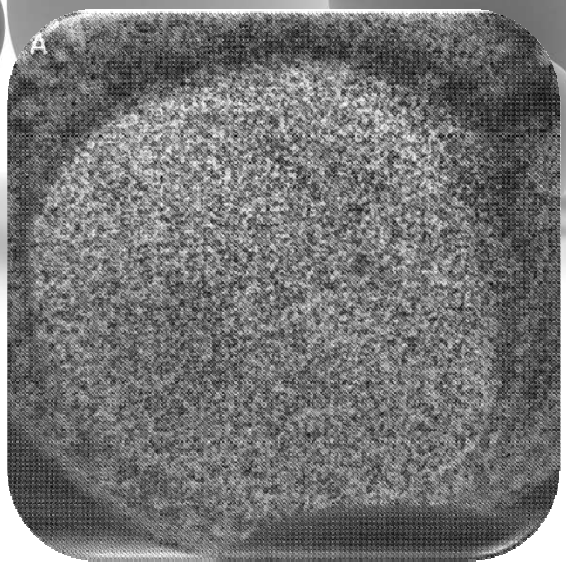
Cooperation is sought with any Party interested in partnering, licensing or investing in the technology, whether it be an investor to fund the project, a partner interested in getting involved in any of the various phases until its placement on the market, a patent licensee, etc. Organisations potentially interested in this technology are those devoted to the manufacture, commercialisation and/or distribution of biomedical devices and implants; as well as universities, hospitals, research centres and all types of institutions interested in biomaterials for manufacturing implants, biomedical devices, etc.

Current stage of development

R&D Phase

Current state of intellectual property

Spanish patent P201030950, granted in January 2013.
International patent application PCT/ES2011/070440.



Optical microscope image showing a Mg-reinforced polymer composite

For further information, please contact

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