NOVEL AND SIMPLE PROCEDURE FOR DISPERSING GRAPHENE DERIVATIVES IN CHEMICALLY CURABLE RESINS.

TECNOLOGÍA PATENTADA

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RESUMEN

The Laboratory of Adhesion and Adhesives of the University of Alicante and the company Dental Global Training, have developed a new procedure to incorporate efficiently graphene derivatives (nanofibers, nanosheets, nanoparticles) in chemically cured resins by using an in situ polymerization technique. The method is very simple and fast, it provides an excellent dispersion of the graphene derivatives in both the solid components of the resin and in the cured polymer matrix, and is entirely friendly with the environment. The novel method does not require the use of organic solvents nor water, ultrasounds, and high pressure/temperature.

The resulting resin composites show excellent mechanical properties, good wear resistance, easy manipulation and increase the insolubility in oral fluids, and therefor they have special interest in applications in odontology, traumatology and non-medical applications too (automobile, construction, civil engineering, aeronautics, space engineering, electronics and optics). It is looking for companies interested in acquiring this technology for its commercial exploitation.

VENTAJAS Y ASPECTOS INNOVADORES

MAIN ADVANTAGES OF THE TECHNOLOGY

The efficient incorporation of the graphene derivatives into acrylic resins is not optimized yet, and the actual methods are complex and present some limitations. The new method proposed allows an **effective dispersion of the graphene derivatives into polymer matrices** by using a modified in situ polymerization process that:

- Does not require organic solvents or water (only solids are involved).
- Does not require the dispersions with ultrasounds.
- It can be carried out under mild conditions (room temperature and atmospheric pressure), or under high pressure (up to 2 bars) and temperature (up to 65ºC).
- The procedure is quick (it requires less than 1 hour).

INNOVATIVE ASPECTS

A new in situ polymerization procedure very simple and quick that allows obtain, under mild reaction conditions and without using solvent, a good dispersion of graphene derivatives in chemically cured polymer matrices.

APLICACIONES DE LA OFERTA

The present invention can be applied to materials science and chemistry fields. The graphene filled acrylic resins can be used in the following main fields:

1. Odontology: in the manufacturing of a great variety of dental prosthesis (denture base, provisional prosthesis, prosthesis supporting over implants, etc) due to their **insolubility in oral fluids, easy manipulation, low wear resistance,** and **low cost**. The graphene filled acrylic resins also inhibit the polymerization shrinkage, imparts toughness and minimizes the appearance of cracks.
2. Medicine: bone cement for Traumatology.
3. Thermoset adhesives and sealants used in the following fields:
    - Automobile.
    - Construction.
    - Civil engineering.
    - Space engineering.
    - Aeronautics.
    - Electronics.
    - Optics.
    - Others…

COLABORACIÓN BUSCADA

It is looking for companies interested in acquiring this invention for their commercial exploitation through:

- License agreement of the patent.
- In search for financial opportunities to develop new applications, adapt them to specific needs of the company, etc.
- Agreements for technology and knowledge transference.
- Technical reports and scientific assessment.
- Specific training depending on the companies needs.
- Standardization services, calibration, national and international technical rules, etc.
- Technological support on those technologies that require high preparation or sophisticated instruments that are not in the companies grasp.
- Staff exchange for specific periods of time (to learn specific techniques).
- Renting of the internal equipment to clients that wish to continue their own tests (the infrastructure of the Department of Inorganic Chemistry – Adhesion and Adhesives Laboratory - or the Technical Services of Research of the University of Alicante (SSTTI)).