ADHESIVE WITH INNOVATIVE PROPERTIES DUE TO THE ADDITION OF GRAPHENE CARBON MATERIALS

DESCRIPTION OF THE TECHNOLOGY

Polyurethane adhesives are widely used in industry for bonding materials in the footwear, electronics, renewable energy, aeronautics, and construction industries, as well as in composite materials. However, they have limitations due to their mechanical properties and stiffness.

Researchers at the university have developed a process to add graphene carbon materials to polyurethane adhesives in a very small proportion (less than 0.1% by weight). In this way an adhesive is obtained that improves its thermal and mechanical properties (mainly toughness), notably increasing its adhesion properties.

The manufacturing process stands out for the reduction of steps since it is not necessary to functionalize the graphene carbon materials or the use of ultrasounds to disperse the graphene material in the adhesive.

A process of synthesis of polyurethane adhesives with graphical carbon materials has been developed for the following types of adhesives:

- Solvent-free polyurethane adhesives (100%)
- Organic solvent-based polyurethane adhesives
- Water-based polyurethane adhesives.

The resulting adhesives have been tested in multiple tests verifying their new properties. These properties are ideal for use in applications with high requirements, such as in the electronic components industry.

MARKET APPLICATION SECTORS

This type of adhesives has a wide variety of application fields. It can be used in the union of different materials where adhesion requirements are high and also requires high performance in its thermal, mechanical (particularly toughness) and electrical properties.

Among its fields of application are its use in the manufacture of electronic components, energy storage devices, gas purification systems, etc.

TECHNICAL ADVANTAGES AND BUSINESS BENEFITS

- Significant improvement in the adhesion properties of polyurethane adhesives.
- The resulting adhesive has excellent thermal, mechanical and conductivity properties, as well as improved toughness.
- It requires a minimum amount of graphene carbon material (less than 0.1% by weight). In the state of the art there are some examples of the addition of graphene carbon materials to adhesives but in no case in such a low proportion.
- The addition of graphite oxide (GO), ground graphite (MG) or nanolamines of graphite or graphite (GNP) does not require the use of ultrasound to disperse in polyurethane adhesives.
- Non-functionalised graphene carbon materials are used. Until now, most of the previous studies in polyurethanes require the functionalization of the graphical material.
- The viscosity and color of the polyurethane adhesive are not altered by the addition of carbon graphite material (less than 0.1% by weight).

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CURRENT STATE OF DEVELOPMENT

The manufacturing process has been carried out satisfactorily at the laboratory level where the combination of components and synthesis processes have been optimised.

Different polyurethane adhesives have been developed by combining different graphene carbon materials. These adhesives have been synthesized by means of different solvent-free procedures (100% solids), in organic solvent base and in aqueous base.

These adhesives have been analysed and tested, obtaining satisfactory adhesion and toughness indices.

INTELLECTUAL PROPERTY RIGHTS

This technology is protected by patent application.

- Patent title: "Polyurethane adhesives improved by the addition of graphical carbon materials".
- Application number: P201830167
- Date of application: 23/02/2018

COLABORATION SOUGHT

Researchers are looking for partners to negotiate patent licensing agreements, as well as to develop R&D projects to look for new applications for adhesives.

RELATED IMAGES

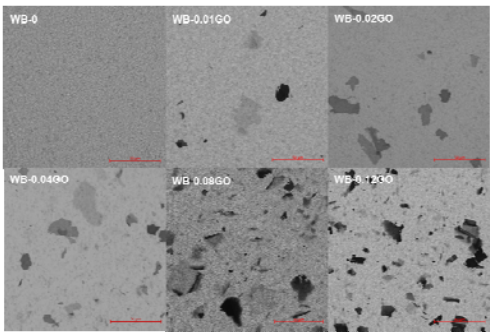
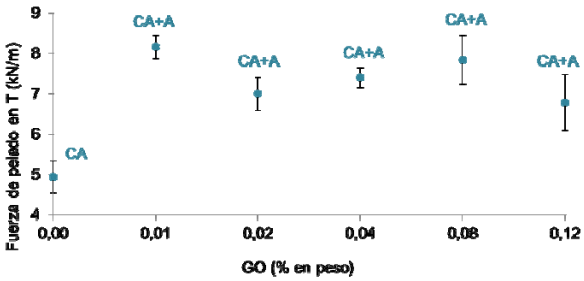


Image 1: polyurethanes SEM micrographs with different amounts of GO



A : Adhesión; CA : Rotura cohesiva del adhesivo

Image 2: T-peel strengths of water-based polyurethane adhesives from adhesive bonds made with adhesives with different amounts of graphene oxide (GO)).

CONTACT

Technology Transfer Service
University of Alicante
Phone: +34 965 909 959
Email: areaempresas@ua.es
Web: http://innoua.ua.es/