MICROMECHANICAL DRY EXFOLIATION DEVICE

DESCRIPTION OF THE INVENTION

After the discovery of graphene, laminar materials have aroused great interest in the scientific community and industry. Monolayers of these materials may present unique mechanical, optical or electronic properties, opening the possibility to develop new applications. The characteristics of these materials allow the deposition of monolayers on various substrates by for example the micromechanical exfoliation method commonly called "Scotch tape." This procedure has been widely used for the delamination of graphite, but is severely limited by the small amount of material obtained and its low quality and reproducibility, which has prevented the escalation of the procedure and its application as an industrial method. There are many alternative methods to "Scotch tape", however most of the dry methods require specific instrumentation and are very difficult to implement in a conventional laboratory.

Researchers from Universitat de València have developed a new device for dry micromechanical exfoliation of two-dimensional laminar materials.

The great simplicity coupled with the relatively high efficiency of the micromechanical exfoliation method "Scotch Tape" has inspired the development of this device, including substantial improvements. The new method enables the exfoliation of two-dimensional laminar materials on any surface in a clean and reproducible way. It doesn't produce defects in the substrate and makes it possible to obtain larger areas of monolayers and with higher density than those obtained by conventional methods. In particular, the new device is especially interesting for the exfoliation of metal dichalcogenides (i.e.TaS2) because these materials are more difficult to delaminate using the traditional "Scotch tape" method.

BUSINESS APPLICATION SECTORS

Materials: Monolayers of laminar materials have many potential applications, especially in optical and electronic industries. The device is applicable to delamination and production of monolayers of any two-dimensional laminar material, highlighting the good results obtained with metal dichalcogenides such as TaS2. Other examples of materials to be delaminated would be graphite, mica, laminate materials with intercalation compounds, etc.

TECHNICAL ADVANTAGES AND BENEFITS

The main advantages provided by the invention are:

- Versatility: the method is applicable to any two-dimensional laminar material and on any surface as substrate.
- Simplicity: the method consists on a dry exfoliation without adhesive materials.
- Quality and reproducibility: the exfoliation is clean (no trace of adhesive), reproducible and without producing defects in the substrate.
- Efficiency: it is possible a deposition of a high density of monolayers of the material.
- Control: it is possible to control applied forces, allowing the method to be easily adjusted to the specific material to delaminate.

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DEVELOPMENT STATUS

The technology has been validated in laboratory, and a prototype of the device is available.

INTELLECTUAL PROPERTY RIGHTS

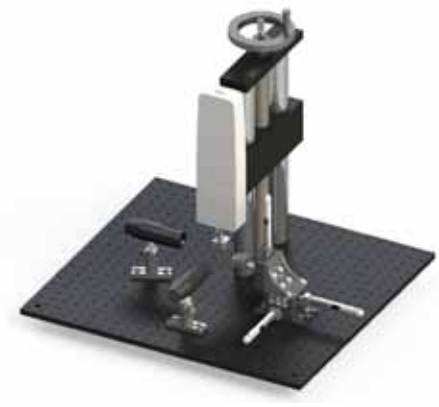
The technology is protected through the following patents:

Spanish patent application P201300252, titled “Método y sistema de exfoliación micromecánica por vía seca de materiales laminares bidimensionales”.

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



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