MICROSCOPE FOR TWISTRONICS AND SPINTRONICS STUDIES

PATENTED TECHNOLOGY

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ABSTRACT

Researchers from the **Nanophysics group**, from the Department of Applied Physics at the University of Alicante, have developed a microscope whose structure and assembly allows twistronics and spintronics studies to be carried out jointly. Specifically, it allows the development of topography studies with atomic resolution, electronic transport studies and spin studies with the possibility of angular variation.

This invention, manufactured by **3D printing**, stands out for its versatility, easy assembly, low price and adaptability to different experimental techniques.

The group is looking for companies or institutions interested in acquiring this technology for its commercial exploitation.

TECHNOLOGY ADVANTAGES AND INNOVATIVE ASPECTS

MAIN ADVANTAGES OF THE TECHNOLOGY

The main advantages of this technology are the following:

- It provides a solution to the problem of being able to have a device with which **combined** twistronics and spintronics studies can be carried out.
- It is an industrially manufacturable device that is easy to assemble, which makes it highly **versatile**, as it is possible to change the working technique simply by replacing some of its parts quickly and easily.
- The product is manufactured by a 3D printer, which **reduces costs and production times**.
- The 3D printer allows working with different types of recyclable polymers. In this case, polylactic acid or PLA has been chosen, which is derived from **natural, renewable and economical raw materials**.
- It does **not change its functionality** in the presence of magnetic fields. Generally, metal microscopes have magnetic impurities which cause magneto-construction effects, thus affecting topography or electrical/spin transport measurements.
- It can assist in the generation of dynamic, fixed-angle or variable-angle, proximity-tunneling gaps between facing and rotated two-dimensional electrodes. This makes this microscope suitable for use in **sequencing DNA, RNA, proteins, sugars or biomaterials**.

INNOVATIVE ASPECTS

The structure of a Scanning Tunneling Microscope (STM) has been reinvented in order to carry out innovative twistronics and spintronics studies together. This microscope has been manufactured using 3D printing, which is a major advantage over non-standardised microscopes on the market.

The use of this manufacturing method allows it to be developed easily, quickly and accurately, as well as solving the problems of machining, standardisation and reproducibility of this type of instrument. Specifically, Polylactic Acid (PLA) has been used as a manufacturing material, which allows the microscope to be economical and sustainable, unlike current titanium microscopes.

As mentioned above, all previous studies in the field of twistronics have been based on two-dimensional overlapping slides, however, such a

configuration does not allow for a controlled spin-switch with mechanical rotation. Therefore, this twistronics proposal, with electrodes facing each other at the edge, is totally innovative and clearly offers the possibility of controlling the relative angle between the electrodes to form a spin-switch.

MARKET APPLICATIONS

It is primarily aimed at the **nanoelectronics** sector, more specifically, companies manufacturing tunneling microscopes (STM).

COLLABORATION SOUGHT

The group is looking for companies or institutions interested in acquiring this technology for **commercial exploitation**.