BLACK TITANIAS FOR PHOTOCATALYSIS, SOLAR CELLS AND ENVIRONMENTAL APPLICATIONS

PATENTED TECHNOLOGY

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ABSTRACT

The Molecular Nanotechnology Lab (NANOMOL) of the University of Alicante (Spain) and the Organometallic Molecular Materials Research Group from the University of La Rioja (Spain) have developed a new synthetic approach for the synthesis of black titanias with outstanding photocatalytic activity under visible light. This novel procedure is simple (one-pot synthesis), versatile and cheap (mild conditions, without the concurrence of surfactants, calcinations or high temperature steps) thereby saving cost in materials and energy.

The technology has been developed and successfully tested at the laboratory getting black titanias with excellent photocatalytic activity both in the ultraviolet, and what is more interesting, in the whole visible range, and good thermal and hydrothermal stability. These materials find application in very different areas such as the degradation of organic pollutants, DeNOx processes or as an alternative to the Grätzel solar cells.

The technology is protected by a Spanish patent application and the group is looking materials producing companies interested in acquiring the technology for commercial purposes, or to establish partnerships for the development and industrial scale, or companies interested on testing the materials for photocatalysis, solar cells or environmental applications.

TECHNOLOGY ADVANTAGES AND INNOVATIVE ASPECTS

ADVANTAGES OF THE DEVELOPED TECHNOLOGY

- The proposed synthetic method is very simple, versatile and can be carried out at low temperature and pressure, avoiding the use of hazard conditions, such as hydrogen or ammonia at high temperatures, with the consequent saving.
- Our black titania is able use the whole UV and visible range of solar radiation showing a really high photocatalytic activity and thermal stability with an increase of only 0.6% in the production cost in comparison with control titania.
- Crystal disruptors are incorporated into the bulk of the semiconductor which greatly protects them (avoiding the problems associated to the stability of the dye) and improves the electronic transference of the charge-transfer dye.
- Band gap control is carried out by crystal engineering instead of the traditional band gap engineering based on chemical methods (i.e. doping and hydrogenation) diminishing the charge-recombination probability.

INNOVATIVE ASPECTS OF THE TECHNOLOGY

- The titania is black, and then absorb in the whole visible range (band gap 2.74 eV) and maintains its photocatalytic activity at least after 5 cycles reaction with an efficiency of 95 %.
- The synthesis process is simple, inexpensive and versatile (a wide variety of functional compounds can be incorporated in the structure of the titania lattice avoiding blocking the mesoporosity and maintaining the anatase structure).

• Excellent thermal and hydrothermal stability. The functionality is incorporated into the structure of the titania being protected thereby.

MARKET APPLICATIONS

• Photocatalysis. Companies producing photocatalytic materials.

• Solar panels. Companies producing materials for solar panels for the enhancement of its efficiency.

• Materials degradation of contaminants in soil, water or asphalt.

COLLABORATION SOUGHT

Companies interested in acquiring this technology for commercial exploitation by:

- Agreements patent license to use, manufacture or commercialization of the technology.
- Partnerships for development and industrial scale and technology for application in various sectors.