New porous materials for the degradation of toxic compounds and pollutants

DESCRIPTION OF THE TECHNOLOGY

The development of new porous and crystalline metal-organic hybrid materials (MOFs) is a major focus of interest nowadays. Its importance lies in a very high adsorption capacity and the greater chemical versatility exhibited by any family of synthetic materials. These properties make them extremely attractive materials for gas storage, catalysis, ion exchange or degradation of environmental pollutants. Possibly the greatest limitation for the integration of MOFs in industrial applications lies in their large-scale production and their low stability in aqueous media or in the presence of acids and/or bases.

On the other hand, in industrial, chemical or agricultural sectors, products that have toxic or polluting effects on humans and on the earth are used, which is why for a few years they have been investigating compounds or methods to deal with this toxicity and pollution for its degradation. Among these toxic compounds, are organophosphate compounds that are used in insecticides and can have serious consequences on the human nervous system. Currently, an active carbon filter is used as protection against this compound, which means that it can absorb harmful compounds, but not degrade them, so the material becomes saturated and discarded.

Researchers from the Universitat de València and the Universidad de Granada have developed a heterometallic MOF based on titanium and iron that combines high porosity, similar to that of active carbons, with high stability in aqueous media. This combination of metals endows it with catalytic activity for the degradation of toxic compounds in water without the need for additives.

These characteristics make it a novel material that can degrade toxic and pollutants without prior conditioning, which would facilitate its incorporation in different applications such as degrading pesticides, degrading polluting and toxic compounds such as organophosphate compounds, or protection against toxic agents through the use of masks with filters of this material. By combining the capacities to adsorb and degrade catalytically, it has a high detoxification capacity that can increase the useful life of the products in which it is used. Furthermore, this compound is stable in both acidic and basic media and does not lose its catalytic activity during use for a substantial improvement in its durability.

MARKET APPLICATION SECTORS

The technology is applicable in the chemical industry, in agriculture for the degradation of pesticides and in defense and protection materials for military equipment, in addition to being able to be used in water treatment.

TECHNICAL ADVANTAGES AND BUSINESS BENEFITS

The main advantages and benefits provided by the invention would be:

- Degradation capacity of toxic and polluting compounds.
- Increase of the useful life of the products in which it is used.
- The material is highly stable, being possible its application in media with both acidic and basic pHs, which improves its durability.

CURRENT STATE OF DEVELOPMENT

The technology has been experimentally validated and it is in the process of certifying the materials for commercialization.

INTELLECTUAL PROPERTY RIGHTS

The technology is protected through the patent application P201830496 and PCT/ES2019/070341, entitled "Titanium heterometallic metal-organic solids, procedure for obtaining it and its uses" with priority date 02/15/2019, and through the patent application P202030047 entitled "Solid MOF titanium-iron, procedure for obtaining and using it for the degradation of compounds" with priority date 01/22/2020.

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COLABORATION SOUGHT

- License agreement for use and exploitation.
- Subcontracting agreement with another company.
- R&D project to advance development.

RELATED IMAGES

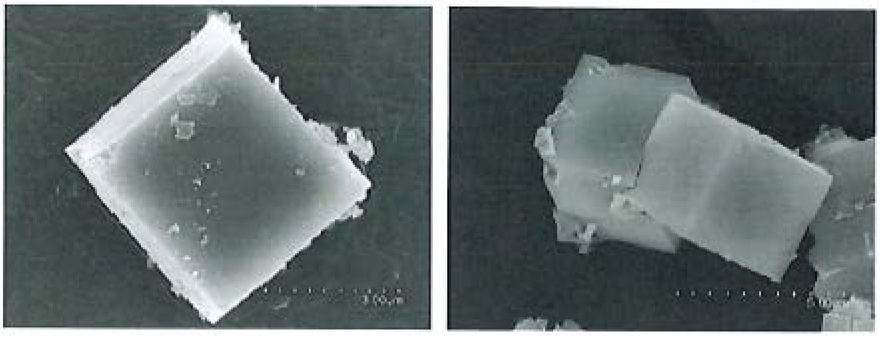

Figure 1. Pictures of scanning electron microscope of the heterometallic MOF.

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