

Nanostructured material for the absorption of organic pollutants in water

CSIC has patented a new material based on high-charged synthetic mica unique for its organophilic properties. The material is very interesting for wastewater treatment by its capacity to remove organic pollutants over a wide range of industrial wastes in water. It can be optimized for each specific waste present in water to comply with the strictest environmental laws. Partners interested in a patent license are being sought.

Water depollutant customizable for specific wastes

The material, an alternative to the state-of-the-art, consists of a hybrid system based on high-charge synthetic mica modified with long-chain organic cations. Its structure is composed of organophilic nanogalleries formed in the interlayer structure of the silicates, between which cations C_{12} - C_{18} are interspersed.

With this technology it is possible to adsorb cations between mica layers, so that it is a useful method to treat wastewater with organic pollutants in batch systems. Here, the key issue lies in the optimization of the synthesis of organic high-charged mica, obtained through ion exchange reactions, in which the inorganic Na^+ cations of the synthetic mica are exchanged with surfactant molecules thanks to its unique exchange capacity and swelling properties.

Typical wastewater contains a multitude of organic compounds with unique adsorption properties. The capacity of organic mica has been tested to remove phenol, benzene and toluene in a single batch reactor. The adsorption on the organomica system is more efficient with hydrophobic functional groups, being ideal for non soluble waste in water as e.g. oil, hydrocarbons and pesticides.

Other applications

The adsorption of organic compounds can be controlled by changing certain environmental parameters, such as temperature, pH, etc., making the material extremely interesting for other applications such as controlled dosing drug mechanisms, or selective filters.

Main applications and advantages

- The structure of the material offers a major stability of the organic matrix between the layers of the silicate.
- Organophilic properties are higher than in other organoclays, i.e. the same amount of product adsorbs greater amounts of organic compound (up to 20 times more).
- The layer charge of the aluminosilicates can also be designed to accurately select the organic compounds to be adsorbed.
- Total control of several key factors in the synthesis of organomica material: synthesis and stabilization of nanoparticles, grade of surface modification, and assembly of 2D ordered structures.



The adsorption capacity of the new material makes it useful in different applications, from wastewater decontamination to the controlled dosage medicaments manufacture and customized selection filters.



Patent Status

PCT ("International") application filed. Priority established by a Spanish patent application.

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