A hybrid material to spot organic contaminants in the atmosphere

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The chemist Paula Moriones-Jiménez has obtained a type of hybrid material made up of organic and inorganic components and which is highly porous, a feature of interest for industrial sectors such as the pharmaceutical, automotive and electronic sectors. This material has been applied to detect organic contaminants such as benzene, toluene or xylene in the atmosphere, and also has the potential for use as a water-repellent coating.

The development of hybrid materials is an emerging field in materials science. As the researcher explained, the interest in these materials stems from "the success in combining that stability of inorganic components with the versatility of organic components. Blending them causes the properties of both to be combined and even improved," she said. "Additionally, hybrid materials can be processed in the form of gels, films, fibres, particles or powders. There is virtually no limit to the combinations of organic and inorganic components to produce hybrid materials, which have a huge number of applications in medicine, microelectronics, sensors, optical systems, the automotive industry and decorative surface coatings.

Paula Moriones resorted to a sol-gel process to synthesize hybrid materials; this results in porous materials with properties controlled at ambient temperature, and leads to savings with respect to other processes. The synthesis of these hybrid materials has resulted in a xerogel, a gel in a dehydrated state without any liquid inside it.

Nanometric-sized pores

As the researcher confirmed, gel formation time and the properties of the materials obtained are influenced by the conditions for synthesizing these materials and the proportion of the ones that are organic. Thus, for example, the materials can have smaller or larger nanometric pores. "Pore size is crucial in the applications of these materials, because they can, for example, be used for the controlled release of drugs," she said.

The research by Paula Moriones, which included a stay at the University of Lisbon (Portugal), also yielded other results. "Some of the synthesised materials are highly hydrophobic and repel water. This property enables them to be used in the pharmaceutical industry as elements for selectively trapping other materials on their surfaces or retaining them, and in the glass industry as protective coatings," concluded the researcher.

More information: Fiber optic sensors based on hybrid phenyl-silica xerogel films to detect n -hexane : determination of the isosteric enthalpy of adsorption. Beilstein *J. Nanotechnol*. 2017;475–84.

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