Scientists develop a new material for manipulating molecules

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A scientist at the University of Córdoba, working with an international research team, has created a new porous single-crystal material that could have many applications in nanotechnology and catalysis.

Porous materials contain intermolecular spaces or cavities between atoms. Because these cavities, known as pores, can store and even separate molecules, such materials are of great value in the field of nanotechnology. Already of high importance in industrial applications, there is still some scope for improving the properties of porous materials . According to a study published in the leading journal *Science*, Rafael Luque of the University of Córdoba's Department of Inorganic Chemistry and international collaborators have developed a novel porous material with new characteristics and properties that will improve performance in a range of applications.

The new material is a single crystal, whose continuous crystalline structure ensures greater purity. At the same time, its porosity can be controlled; its structure, comprising micropores smaller than two nanometres, can be enhanced by the incorporation of macropores, i.e. pores greater than 50 nanometres. Rafael Luque says, "This means that larger molecules can be comfortably fitted into the macropores for subsequent conversion or transformation." Moreover, the procedure employed for generating controlled porosity uses polystyrene beads, "an agent which is economical and readily-available."

This research could mark a turning point in various scientific fields.

Luque says, "We have developed a single-crystal material with controlled porosity; these dual properties make materials like this uniquely valuable for a range of applications in the fields of catalysis and adsorption." These findings may, for example, make catalysis—the acceleration of a chemical reaction—faster, more effective, and more sensitive to varying sizes and shapes of molecule. The new material may also have key applications for gas (CO2)adsorption and electronic conductivity.

More information: Kui Shen et al. Ordered macro-microporous metal-organic framework single crystals, *Science* (2018). DOI: 10.1126/science.aao3403

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