Potential carbon capture role for new CO2 absorbing material

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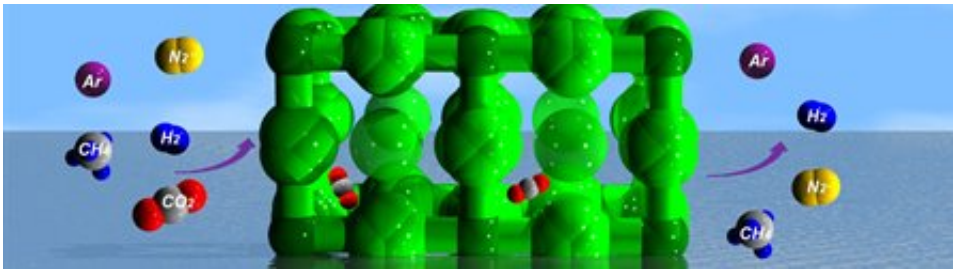

(Phys.org) -- A novel porous material that has unique carbon dioxide adsorption properties has been developed through research led by The University of Nottingham.

The findings, published in the prestigious peer-reviewed journal Nature Materials, form part of ongoing efforts to develop new materials for gas storage applications and could have an impact in the advancement of new carbon capture products for reducing emissions from fossil fuel processes.

It focuses on the metal organic framework NOTT-202a, which has a unique honeycomb-like structural arrangement and can be considered to represent an entirely new class of porous material.

Most importantly, the material structure allows selective adsorption of

carbon dioxide — while other gases such as nitrogen, methane and hydrogen can pass back through, the carbon dioxide remains trapped in the materials nanopores, even at low temperatures.

Unique material

Lead researcher Professor Martin Schröder, in the University's School of Chemistry, said: "The unique defect structure of this new material shows can be correlated directly to its gas adsorption properties. Detailed analyses via structure determination and computational modelling have been critical in determining and rationalising the structure and function of this material."

The research team — which is included Dr Sihai Yang, Professor Alexander Blake, Professor Neil Champness and Dr Elena Bichoutskaia at Nottingham — collaborated on the project with colleagues at the University of Newcastle and Diamond Light Source and STFC Daresbury Laboratory.

NOTT-202a consists of a tetra-carboxylate ligands — a honeycomb like structure made of a series of molecules or ions bound to a central metal atom — and filled with indium metal centres. This forms a novel structure consisting of two interlocked frameworks.

Innovative solutions

State-of-the-art X-ray powder diffraction measurements at Diamond Light Source and advanced computer modelling were used to probe and gain insight into the unique carbon dioxide capturing properties of the material.

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aimed at applying coordination chemistry to the generation of new multi-functional porous materials that could provide innovative solutions for key issues around environmental and chemical sustainability.

These projects incorporate multi-disciplinary collaborations across chemistry, physics and materials science, and aim to develop new materials that could have application in gas storage, sieving and purification, carbon capture, chemical reactivity and sensing.

Provided by University of Nottingham