

Confinement of polar molecules to enhance CO₂ capture in MOFs

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Global warming is one of the greatest threats to human civilisation. In particular, the increasing levels of anthropogenic carbon dioxide (CO₂) emissions from fossil fuel combustion directly impact our environment causing the continuous rise of temperatures across the planet. Currently, many world leaders and governments are promoting the development of new technologies for efficient and effective CO₂ sequestration. Porous metal–organic frameworks (MOFs) or porous coordination polymers (PCPs) are amongst the most promising candidates for CO₂ capture because their CO₂ sorption capacity is directly tuneable as a function of the topology and chemical composition of the micropores. An emerging CO₂ capture technology is based on the preparation of hybrid adsorbent materials which can be synthesised by confining solvents inside porous solid supports. It is believed that solvent confinement can promote gas solubility considerably over the corresponding macroscopic values and therefore CO₂ capture enhancement. Our research group has been investigating the confinement of small amounts of polar molecules (H₂O, EtOH, MeOH, *i*-PrOH, *n*-PrOH and DMF) within microporous MOFs that exhibit hydroxo functional groups (μ_2 -OH). Results suggest that the hydroxo functional groups play a fundamental role in the confinement of polar molecules and these, can significantly enhance the CO₂ uptake properties of MOFs-(μ_2 -OH).

