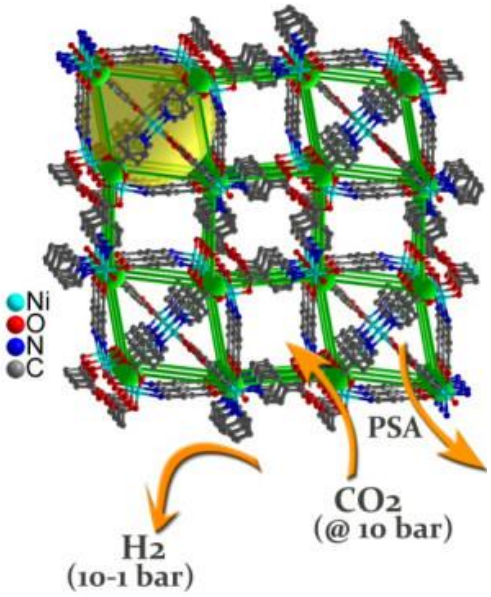
# Molecular sieve from micro-porous metal complexes as efficient filter for the greenhouse gas

Coal-fired power plants cover about forty percent of global electricity needs and represent one of the biggest sources of climate-damaging carbon dioxide. Clean coal can be used when you have multiple process steps wherein it is converted to a gas mixture of hydrogen and carbon dioxide. To detach the carbon dioxide efficiently, an international group of researchers have now developed a new, extremely porous material. As you can see in the journal "Science Advances" reports that could advances crystalline, metal-organic structures - short MOF - carbon dioxide as a sponge record and repeated for gas purification.




*This metal organic structure (Crystal Model, MOF) can, in its ultra micro-pore hold unusually high carbon dioxide.*
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"These metal organic framework materials can posses large surface areas", says Ramanathan Vaidhyanathan from the Indian Institute of Science Education and Research in Pune. The area of a single MOF crystal, if you notice, can have a size of a football field. With his colleagues from Canada, the USA and Germany Vaidhyanathan's team have developed a new metal organic structure, in which atoms of nickel combines with one type of organic molecule, the ligands. In a wet chemical processes, a solution from nickel carbonate is fed with organic acids such as pyridine carboxylic acid for three days to 150 degrees Celsius. Once this solution is filtered and dried, you have a few grams of your extremely porous material. From a gas mixture of hydrogen and carbon dioxide it took it selectively relatively large quantities of the greenhouse gas in its only about half a nanometer small pores. This storage happens at higher pressures of up to ten bar, which represents the requirements of a large-scale use. Once saturated with carbon dioxide,

the crystals can be depressurized to ambient pressure, with low energy expenditure, to collect the $CO_2$ and to recycle the sorbent again for gas purification.

To prepare their experiments, the scientists have carried out complex simulations, which lead to this effective material formed by combination of nickel and pyridine carboxylic acid. Although other research groups in previous attempts have already shown that metal organic frameworks are highly suited for selective inclusion of $CO_2$, the new material could be significantly easier to manufacture and after use regeneration. Moreover it is also much more stable in a humid environment.

As a future step, if this porous carbon dioxide capture material can be produced in larger scales it could make the separation of carbon dioxide from combustion gases or gas mixtures easier and cheaper. This somewhat more climate-friendly way of using coal is however more expensive than the currently used direct combustion.