New technology creates carbon neutral chemicals out of thin air

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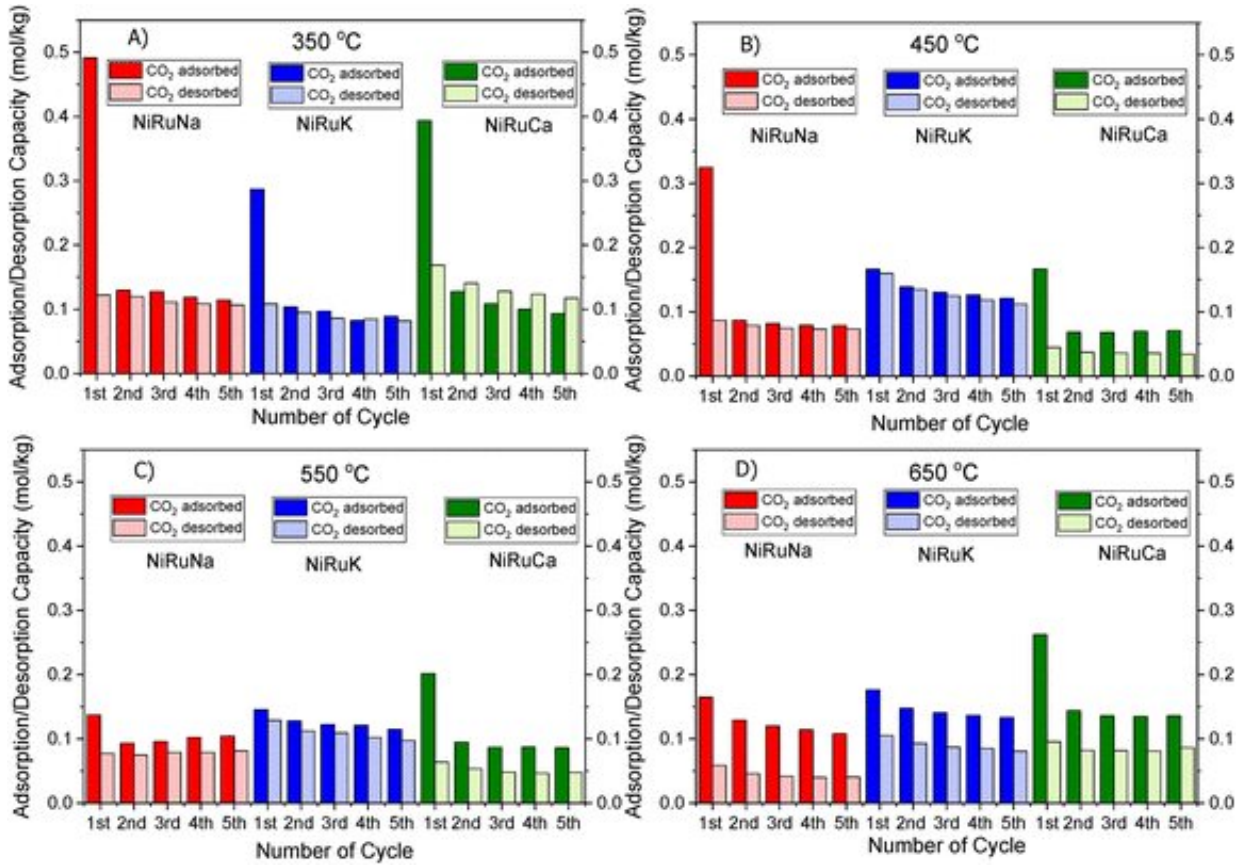

CO2 Adsorption/desorption cycles of NiRuNa, NiRuK and NiRuCa at (A) 350 °C, (B) 450 °C, (C) 550 °C and (D) 650 °C. Credit: *Nanoscale* (2022). DOI: 10.1039/D2NR02688K

It is possible to capture carbon dioxide (CO_2) from the surrounding

atmosphere and repurpose it into useful chemicals usually made from fossil fuels, according to a study from the University of Surrey.

The technology could allow scientists to both capture CO_2 and transform it into useful chemicals such as carbon monoxide and synthetic natural gas in one circular process.

Dr. Melis Duyar, senior lecturer of chemical engineering at the University of Surrey explained: "Capturing CO_2 from the surrounding air and directly converting it into useful products is exactly what we need to approach carbon neutrality in the chemicals sector. This could very well be a milestone in the steps needed for the U.K. to reach its 2050 net-zero goals.

"We need to get away from our current thinking on how we produce chemicals, as current practices rely on fossil fuels which are not sustainable. With this technology we can supply chemicals with a much lower carbon footprint and look at replacing fossil fuels with carbon dioxide and renewable hydrogen as the building blocks of other important chemicals."

The technology uses patent-pending switchable Dual Function Materials (DFMs) that capture carbon dioxide on their surface and catalyze the conversion of captured CO_2 directly into chemicals. The "switchable" nature of the DFMs comes from their ability to produce multiple chemicals depending on the operating conditions or the composition of the added reactant. This makes the technology responsive to variations in demand for chemicals as well as availability of renewable hydrogen as a reactant.

Loukia-Pantzechroula Merkouri, Postgraduate student leading this research at the University of Surrey added, "Not only does this research demonstrate a viable solution to the production of carbon neutral fuels

and chemicals, but it also offers an innovative approach to combat the ever-increasing CO_2 emissions contributing to global warming."

The research is published in *Nanoscale*.

More information: Loukia-Pantzechroula Merkouri et al, Feasibility of switchable dual function materials as a flexible technology for CO2 capture and utilisation and evidence of passive direct air capture, *Nanoscale* (2022). DOI: 10.1039/D2NR02688K

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