CO₂ REDUCTION

The importance of being porous

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CO₂ can be electrochemically reduced to CO using catalysts based on nitrogen-doped carbon. The CO product can subsequently be converted into a range of fuels and chemicals, reducing reliance on fossil fuel resources. While nitrogen-doped carbon catalysts are often porous, deconvoluting the impact of porosity on catalytic behaviour is challenging due to other variables also changing in a given set of catalysts. Now, Csaba Janáky and colleagues in Hungary and the USA show that pore size plays an important role in determining the performance of nitrogen-doped carbon materials within a group of catalysts that are otherwise comparable in terms of key properties.

Employing a silica template synthesis method, the researchers prepared a series of nitrogen-doped carbon samples each with a different average pore size, ranging from 13 nm to 90 nm. However, based on spectroscopic and structural characterization the materials were found to be very similar in terms of their electronic properties and the functional groups at the surface (for example, the carbon and nitrogen speciation, which are thought to influence catalytic behaviour), allowing the impact of porosity to be isolated. Accounting for differences in the overall surface area between the samples, the pore size was found to have a large effect on the selectivity of the reaction to the desired CO product; the best catalyst had a pore size of 27 nm and exhibited three times the selectivity to CO as that of a non-porous control.

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