Greenhouse effect: the goal is to decarbonise

Advanced catalytic architectures using 3D printing for efficient carbon dioxide recycling

Global warming associated with the emission of greenhouse gases is a major environmental issue, with repercussions on the entire global economic system.

Tackling climate change and reducing greenhouse gas emissions is now a common goal. Europe, in particular, is pursuing a rigorous 'decarbonisation' process to progressively move away from fossil fuels. A great opportunity in this scenario is now offered by technologies capable of capturing carbon dioxide (one of the main 'greenhouse' gases) and converting it - using renewable hydrogen - into products with high added value.

This is the background of the 'CO_2 Fokus' project, a Belgian-coordinated H2020 that is now halfway through. "The goal is to develop an innovative technology to recycle carbon dioxide emissions in a single-stage hydrogenation process for the production of dimethylether," explains researcher Giuseppe Bonura of Cnr-Itae in Messina, one of the project's partners.

Dimethylether, which under ordinary conditions is in a gaseous state, has recently attracted significant research interest, since at low pressure it can be transformed into a liquid form and is therefore easily transportable.

Moreover, its simple molecular structure makes it an interesting substitute for fossil diesel: a highly efficient 'green' fuel. "Today, dimethylether is usually produced by a two-stage process, through the dehydration of previously synthesised methanol by conversion of synthesis gas - continues Bonura - CO_2Fokus aims to develop an innovative and sustainable process for the production of dimethylether in a single stage, integrating a solid oxide electrochemical system capable of supplying green hydrogen and a multi-channel catalytic reactor made by 3D printing, with selective laser melting technology of metal powders". The catalytic system, formulated by researchers at Cnr-Itae, will be housed inside the multi-channel reactor and will enable the continuous production of dimethylether from CO_2 and hydrogen mixtures. "The pilot system, located in Turkey, will demonstrate how we can reduce dependence on fossil fuels in the chemical and energy sectors - concludes Bonura - by steering sustainable development towards a low-carbon society". ■

The "Nicola Giordano" Institute for Advanced Energy Technology in Messina is one of the WP leaders of the CO_2Fokus project

CO_2Fokus technological approach