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## **Nanocatalysts to turn carbon dioxide and water to carbon-neutral synthetic fuels**

An important approach towards an efficient and sustainable economy is storing the surplus of renewal energy into chemicals through water splitting and CO<sub>2</sub> reduction, to convert them in carbon-neutral synthetic fuels. To this end, several technologies can be pursued, from photocatalysis, electrolysis or thermochemical conversion, and thus, catalysis is playing a major role in the activation of the stable water and carbon dioxide molecules. To find the suitable processes, together with new cheap and earth abundant nanocatalysts adaptability is mandatory for large scale industrialization and deployment of the novel technologies.

In this talk, the recent advances will be presented in the production in our laboratory of solar fuels by photoelectrocatalysis and low temperature CO<sub>2</sub> electrolysis as well as CO<sub>2</sub> conversion from biogas by conventional thermocatalytic hydrogenation and plasma-catalysis. For upscaling the technology, a mandatory focus on the selectivity, productivity, costs and energy efficiency should be taken into account as well as a discussion on the intrinsic limitations of some of the processes, to look at the future challenges for its practical implementation to replace fossil fuels.