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CO₂OLING THE EARTH

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Catalytic vs electrocatalytic reduction of CO₂ to added-value products.

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Currently, around 85% of the energy matrix is dependent on fossil fuels. Burning fossil fuels provokes environmental pollutants such as CO₂, which is the most representative GHG and its concentration has increased in the atmosphere after industrial revolution to >410 ppm[1]. Therefore, to mitigate CO₂ emissions into the atmosphere, it can be exploited as a raw material to synthesize high added-value products (i.e. methanol) [2]. The electrochemical (EC) reduction of CO₂ is a sustainable and technologically interesting process to produce chemicals or fuels using renewable electricity sources[3]. The main challenge is to find a suitable electrocatalyst to establish this technology at an industrial level. In such context, our group have exploited, for this EC process, a Cu-based material typically used as catalyst in Thermochemical (TC) catalysis for the production of methanol. A commercial catalyst (Cu-Zn-Al-based) was tested for both processes for comparison. The TC CO₂ reduction reaction in H₂ atmosphere (25 bars and 250 °C) leads to a methanol selectivity of 50% and CO as side-product, whereas the EC process (at atmospheric conditions) yields different alcohols and other C-based products (C₁ to C₃) with an overall faradaic efficiency of ~70%. The EX situ X-ray diffraction pattern, Field-Emission Electron Microscopy and Transmission Electron Microscopy of the catalyst were compared before and after both experiments in order to study the role of the modification of the catalyst components during operation in the final selectivity. These results demonstrated that there is synergy between both processes that can be exploited to develop new electrocatalysts.

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Biography

Hilmar Guzmán has completed his master's degree and bachelor's degree at Politecnico di Torino (Italy), in the framework of a double degree between Politecnico di Torino (Italy) and Universidad Central de Venezuela (Venezuela). She is currently in the third year of her PhD course, which is focused in the conversion of CO₂ through an electrocatalytic route.

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