Colloidal nanocrystals to design selective and stable electrocatalysts

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CO_2 electroreduction is a promising approach to convert waste CO_2 into value added products, such as ethylene or ethanol. Copper is typically used to catalyze the reaction and a great progress has been made in understanding the parameters which govern its activity and selectivity. A new challenge now must be faced for the technological implementation of this reaction, which is stability at both the catalyst and the device level.

In this talk, I will focus on how well-defined and tunable nanocrystals synthesized by means of colloidal chemistry aid the development of active, selective and stable catalyst for CO2 electroreduction. [1-3] I will also briefly discuss recent results on the opportunities offered by a tandem process including CO2 to CO followed by CO conversion. [4]

[1] L. Zaza, K. Rossi, R. Buonsanti* "Well-Defined Copper-Based Nanocatalysts for Selective Electrochemical Reduction of CO2 to C2 products" *ACS Energy Lett* **2022**, 7, 1284

[2] J. Vavra, G. P. L. Ramona, F. Dattila, A. Kormányos, T. Priamushko, P. P. Albertini, A. Loiudice, S. Cherevko, N. Lopéz, R. Buonsanti "Solution-based Cu+ transient species mediate the reconstruction of copper electrocatalysts for CO2 reduction" *Nature Catal.* **2024**, 7, 89.

[3] P. P. Albertini, M. A. Newton, M. Wang, O. Segura Lecina, P. B. Green, D. C. Stoian, E. Oveisi, A. Loiudice, R. Buonsanti "Hybrid Oxide Coatings Generate Stable Cu Catalysts for CO2 Electroreduction" *Nature Mater.* **2024**, 23, 680

[4] M. Wang, A. Loiudice, E. Ibanez Ale, K. Kumar, D. Stoian, Z. Lian, P. P. Albertini, L. Zaza, J. Leemans, N. Lopez, R. Buonsanti "Colloidal copper nanospheres boost propanol electrosynthesis from CO", doi: 10.21203/rs.3.rs-4544481/v1