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Catalytic strategies for the conversion of CO_2 into valuable products

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Resumo/Abstract

CO_2 capture and utilisation is a central research topic in the context of sustainability. The use of CO_2 feedstock is attractive not only in order to decrease the concentration of this greenhouse gas in the atmosphere but also because CO_2 is a non-toxic, inexpensive, widely-available, renewable and thus green C_1-feedstock. However, the conversion of CO_2 into useful products is a challenging target, due to the high thermodynamic stability of this molecule. There are two main strategies to overcome this limitation: (i) provide energy, *e.g.* in the form of electricity (electrochemical conversion); (2) react CO_2 with high free energy compounds (*e.g.* H_2, epoxides, amines). In both cases, a catalyst is essential to improve the kinetics of the process and achieve the efficient conversion of CO_2 into selected valuable products. In this presentation, you will hear about our recent research achievements in the context of CO_2 conversion, using different catalytic approaches ranging from homogeneous to heterogeneous catalysis and finally touching electrocatalysis. For the conversion of CO_2 into cyclic carbonates, we developed metal-free homogeneous and heterogeneous catalysts that enable the synthesis of the target products with high selectivity under mild conditions. The presentation will then delve into the conversion of CO_2 into polycarbonates using heterogeneous catalysts and the challenges of the upscaling of the production of these polymers towards industrial scale. Finally, you will hear about the growing area of electrocatalysis for the reduction of CO_2 into useful products, with a focus on formic acid synthesis.