Solar light CO_2 photoreduction enhancement by mononuclear rhenium(I) complexes: Characterization and mechanistic insights

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Carbon dioxide is one of the main greenhouse gases in the Earth's atmosphere and stands out due to its versatility in terms of product formation. At present, there is much interest in devising strategies to capture and convert this gas into economically valuable chemicals.[1] CO_2 conversion can be achieved through a variety of technologies, such as electroreduction, and photochemical reduction, to name a few. Photocatalysis and plasma technology are promising methods for CO_2 conversion, as they operate at ambient pressure and temperature, and are capable of converting CO_2 into basic chemicals that can be easily converted into synthetic fuels, high-value chemicals, and other products (such as CO, CH_4 and CH_3OH).[2-4] In the process of CO_2 conversion, various types of molecular complexes or materials (i.e. metal organic frameworks) based on different metal centers can serve as catalysts.[5] Of these, rhenium bipyridine complexes have been extensively studied as photocatalysts for CO_2 reduction. These complexes only require a sacrificial donor to reduce CO_2 into CO.[6] Our work aims at synthesizing a novel Re(I) complex (Figure 1) that can be used for CO_2 photoreduction and

CO_2 plasma conversion through both homogeneous and heterogeneous approaches. Here we present our results regarding the photoreduction of CO_2 to CO using a solar light simulator, and the subsequent mechanistic studies aimed at understanding this new Re(I) photocatalyst. Our photoreduction experiments have shown that the Re(I) photocatalyst remains active even in the nanomolar scale.

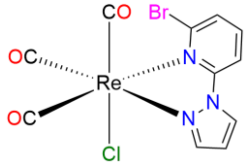

Figure 1. Rhenium complex used in this work.

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Other information:

I'm a 3rd year PhD student (26 years old) studying Chemistry at the Sciences Faculty of the University of Lisbon.
Research interests: CO_2 conversion, Catalysis, Inorganic chemistry, and Photochemistry.
I'm also available to share my presentation at the end of the session.