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Investigating Light-Driven Solutions for Clean Energy in Polo Group

The development of sustainable energy technologies requires efficient strategies for harvesting sunlight and converting it into useful energy. Polo Group is addressing this challenge through two approaches: converting sunlight directly into electricity with solar cells, and CO₂ photoreduction, where light-induced electron transfer is used to drive the selective transformation of CO₂ into CO.

Perovskite solar cells are among the most promising emerging technologies in photovoltaics. It is cheap to produce, lightweight, and very efficient. The main drawback of this technology is its durability, and many approaches to address it have been described in the literature, including modifications to the perovskite composition or dimensionality. In our group, we are trying to understand how these changes can increase the durability of these solar cells and what the impact is on charge-carrier dynamics, which in turn affect the overall efficiency of the devices.

Investigation on CO₂ photoreduction using Re(I) polypyridyl compounds is also being conducted in our group. In this approach, we aim to understand the photochemistry of these compounds and how changes in the substituents of the polypyridyl ligands can modify the efficiency of CO₂ photoreduction to CO. The use of pyrrol, indol or carbazole substituents in the 1,10-phenanthroline coordinated to the Re(I) center exhibited noticeable differences in this process, ascribed to the stabilization of the intermediate. Another system using electron donor or withdrawing substituents of 2,2'-bipyridine, also coordinated to the Re(I) center, demonstrates that the electron transfer to One-Electron Reduced Species depends on the bpy substituent and, consequently, changes the CO₂ to CO conversion efficiency. Finally, some perspectives on our future work in both fields will be presented.

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時間: 14:00-15:00

会場: C612, 理学部

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