The beauty of photoelectrochemistry for solar energy conversion and storage

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Solar energy conversion plays a very important role in the transition to a more sustainable energy system. The increase in industrialization and urbanization leads to an intensification in the consumption of fossil fuels, causing serious and well-known economic and environmental problems. In this sense, renewable energy sources offer a "half" solution, due to their intermittence, dependence on the weather and poor applicability for movable applications, making urgent the development of new storage energy technologies.

Although new battery technologies will likely meet the need for cost-effective energy storage for short time scales, fuels are the only effective option for longer-term, seasonal storage and long-distance transportation applications. In this sense, collecting and convert solar energy into valuable chemicals and fuels, is a highly desirable approach to solve this challenge. So many systems have been proposed to drive the artificial photosynthesis. However, most of these systems present well-known shortcomings as low light absorption, fast charge recombination and lack of tuneability, limiting the final efficiency. This makes it necessary to develop different strategies that improve the efficiency, durability and applicability of these systems, ranging from the improvement through different modifications of inorganic semiconductors, through the use of novel organic systems such as conjugated porous polymers, to the design and development of hybrid electrodes made of various materials.

This seminar will address some of the most innovative strategies currently being developed to explain the enormous potential of photoelectrochemistry for storing solar energy as fuels in a sustainable way.