Hybrid Molecular Materials for Energy Applications

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The replacement of fossil fuels by a clean and renewable energy source is one of the most urgent and challenging issues our society is facing today, which is why intense research is devoted to this topic.[1] Nature has been using sunlight as the primary energy input to oxidize water and reduce CO_2 to generate carbohydrates (a solar fuel) for over a billion years. Inspired but not constrained by nature, artificial systems can be designed to capture light and oxidize water and reduce protons or other useful substrates such as CO_2 to generate chemical fuels. One of the key aspects for the efficient design of devices for the making solar fuels is the understanding and mastering of the catalysts involved in both the anodic and cathodic reactions. The talk will describe the initial developments up to the state of the art, of molecular catalysts and their anchoring on conductive and semiconductive surfaces. The latter is crucial for the generation of powerful hybrid molecular anodes and cathodes for the production of solar fuels.[2]

[1] (a) Llobet, A. et al. *Nat. Rev. Chem.* **2019,** *3,* 331–341. (b) Llobet, A. et al. *Chem. Soc. Rev.* **2023**, *52,* 196-211.

[2] (a) Llobet, A. et al. *Nat. Chem*. **2020**, *12*, 1060–1066. (b) Llobet, A. et al. *Adv. Energy Mater*. **2020**, 2002329. (c) Llobet, A. et al. *J. Am. Chem. Soc.* **2021**, *143*, 11651–11661. (d) Llobet, A. *Nat. Catal.* **2022**, 5, 79-82, (e) Llobet, A. et al. *ACS Energy Lett*. **2023**, 8, 1, 172–178. (f) Llobet, A. et al., *Adv. Mater*. **2024**, *36*, 2308392. (g) Llobet, A. et al., *Adv. Energy Mat*. **2024**, in press.