

Nanostructured Photoelectrodes: From Energy to Luminescence

Gabriel Loget

Univ Rennes, CNRS, ISCR-UMR 6226, F-35000 Rennes, France

Email: gabriel.loget@univ-rennes1.fr

Photoelectrochemistry at semiconductors electrodes is a wide field of research that combines photon absorption and electrochemical charge transfer. The simultaneous occurrence of both these stimuli at the solid/liquid interface allows triggering electrochemical reactions with a considerably lowered energy input. So far, this phenomenon has been proven very promising for solar-to-fuel conversion applications (e.g., water splitting or CO₂ reduction).[1] In this presentation, I will present the recent progress of our group in the fabrication and understanding of inhomogeneously coated Si-based photoanodes.[2] On the other hand, electrochemiluminescence (ECL) is a light-emitting process and a powerful tool in analytical chemistry. This phenomenon is induced by the excited state of a luminophore, which is generated by an electrochemical reaction at an electrode surface.[3] Thus, photoelectrochemistry at semiconductors is a process where an electrode absorbs light, as opposed to ECL, where the electrode can be considered an emitter. We have been recently exploring the combination of these two concepts, which will be presented in the second part of this contribution.[4]

- [1] a) K. Sun et al. *Chem. Rev.*, **2014**, 114, 8662. b) S. A. Lee et al. *ACS Material Lett.*, **2020**, 2, 1, 107.
- [2] a) K. Oh et al. *Energy Environ. Sci.*, **2018**, 11, 2990. c) G. Loget et al. *Nat. Commun.*, **2019**, 10, 3522. c) K. Oh et al. *Nanoscale*, **2021**, 13, 1997.
- [3] N. Sojic, Analytical electrogenerated chemiluminescence: from fundamentals to bioassays The Royal Society of Chemistry, **2020**.
- [4] a) Y. Zhao et al. *J. Am. Chem. Soc.*, **2019**, 141, 13013. b) J. Yu et al. *Angew. Chem. Int. Ed.*, **2020**, 59, 15157. c) J. Yu et al. *Electrochim. Acta*, **2021**, 381, 138238. d) Y. Zhao et al. *Cell Rep. Phys. Sci.*, in press.