

LIGHT-TRIGGERED ION TRANSFER IN SEMICONDUCTING MATERIALS: TiO₂ NANOCRYSTALS CASE

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An increase of the worldwide population, energy consumption per capita together with depletion of fossil fuels prompt the development of alternative sustainable energy sources. The use of solar energy by means of photovoltaic systems in the day-to-day life is hindered by the intermittent nature of the sun power. Nowadays, hybridization between photovoltaic modules and a storage feedstock is required to ensure the grid stabilization in the delocalized future grid deployment. One innovative approach would be to develop a new technological paradigm with a device able to combine energy conversion and energy storage functions. Interestingly, Tributsch was the first to demonstrate that interfacial ion transfer can be onset in semiconducting materials [1]. In our group, we pursued this approach on bifunctional materials combining conversion and storage capabilities. This work led to the demonstration of a first photo-rechargeable half-cell lithium battery which can be recharged by light in less than 1-hour exposure and to a concept of non-intermittent PV device, thus closing the gap between electrochemical energy storage batteries and photovoltaics [2]. In the current oral communication, we will be presenting this interesting concept based on anatase TiO₂ nanocrystals electrode together with insights into photoelectrochemical mechanisms involved during the electrode photorecharge and their limitations [3].

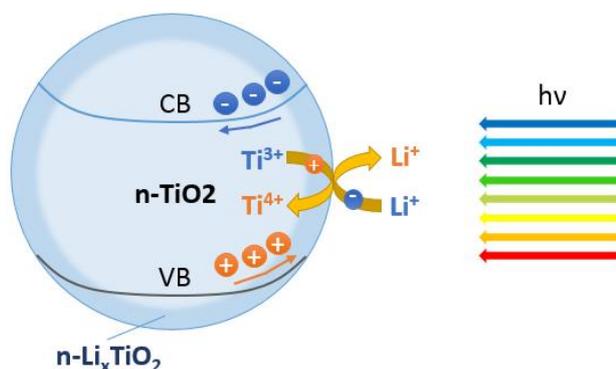


Figure 1. Schematic representation of the charge separation and Li⁺ de-insertion processes in L_xTiO₂ / TiO₂ nanocrystals under incident sunlight

[1] H. Tributsch, *Applied Physics*, **1980**, 23, 61-71

[2] C. Andriamiadamanana, C. Laberty-Robert, F. Sauvage, CNRS-UPJV-UPMC, PCT/FR2014/053056

[3] C. Andriamiadamanana, I. Sagaidak, G. Bouteau, C. Davoisne, C. Laberty-Robert, F. Sauvage, submitted