MODIFICATION OF SEMICONDUCTING NANOSTRUCTURES FOR PHOTOCATALYSIS AND PHOTOSYNTHESIS APPLICATIONS

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Using solar energy to achieve chemical reactions, for pollutants remediation or for solar fuels generation is a promising technology that goes beyond PV. Materials and assemblies need to be specifically developed to achieve efficiently photo-catalytic (ex: pollutant or COV degradation) or photosynthetic (water splitting for H_2, CO_2 photo-reduction) reactions. Both types of reaction requires the design of materials that can efficiently absorb photons to generate charge carriers (e^-, h^+ pairs), transport these charges to reaction sites (before they recombine) and catalyze the targeted oxidation and reduction reactions.

The presentation will detail what are the requirements, in terms of materials properties, for photo-catalytic and photo-synthetic reactions through some examples of applications. It will focus on the improvement of photo-conversion efficiency that can be reached by using nanomaterials and the material chemistry for engineering the electronic structure of semi-conductors.[1,2] Beside the intrinsic properties of the SC materials, the importance of their surface modification with co-catalyst particles will also be shown.[2] The influence of photoactive materials morphology, in different photo-(electro)catalytic cells and reactors, on the charge carrier transport and light collection properties will be discussed. Finally, we will describe some recent devellopements in caracterisation methods of photocatalytic materials and photoelectrodes and their contribution to extract key parameters to improve photocatalytic materials design.[3,4]

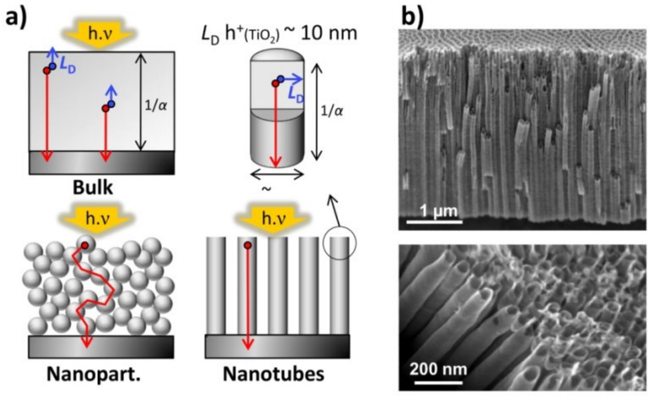

Figure 1: a) Charge carrier's path in bulk, 1D nanotubes or nanoparticles; b) SEM images of TiO_2-NTs.

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