Charge Separation in layered Titanate Nanostructures: Effect of Ion Exchange induced Morphology Transformation

O. DIWALD, A. RISS, H. GROTHE, Vienna University of Technology, Institute of Materials Chemistry, J. BERNARDI, Vienna University of Technology, USTEM, E. KNOEZINGER, Vienna University of Technology, Institute of Materials Chemistry, IMC TU WIEN TEAM — Morphology changes induced by surface chemistry can provide important insights into photoexcitation processes on solids which are critical to photovoltaic and photocatalytic applications. We investigated charge separation processes on Na$_2$Ti$_3$O$_7$ nanowires and scrolled up H$_2$Ti$_3$O$_7$ nanotubes, two types of morphologies which by means of acid/base treatment can reversibly be transformed into each other. Some of the competitive processes photoexcited states undergo can be tracked by means of electron paramagnetic resonance and photoluminescence spectroscopy. A complementarity between efficient charge separation and radiative recombination of photoexcited states [1] was observed and clearly demonstrates the critical influence of morphology and interlayer composition on the photoelectronic properties of layered oxide nanostructures [2]. [1] Riss et al. Nano Lett. 2007, 7, 433-438. [2] Riss et al. Angew. Chem. Int Ed. 2007, anie.200703817, in press

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