

Critical Factors of Dye-Sensitized Solar Cells using TiO₂ Nanotubes

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Self-organized TiO₂ nanotube layers have over the past decade attracted wide scientific and technological interest.[1] One of their key applications is their use in dye sensitized solar cells. Using nanotubes instead of nanoparticles is mostly done with the expectation of faster electron transport (directionality), less grain boundary recombination, and optimized light scattering properties.[2]

In this present work, we introduce novel anodization procedures that allow unprecedented tube dimensions and properties. We show that TiO₂ nanotube layers can be electrochemically grown with an extremely high growth rate 50µm / 360s – these layer show very high adherence to the substrate and allow the construction of highest aspect ratio tubular solar cells reported so far. The presentation will also address other key factors when constructing DSSCs from TiO₂ based nanotube layer.

[1] P. Roy, S. Berger, P. Schmuki, TiO₂ nanotubes: Synthesis and applications, *Angew. Chem. Int. Ed.*, 50 (2011) 2904-2939.

[2] K. Zhu, N.R. Neale, A. Miedaner, A.J. Frank, Enhanced charge-collection efficiencies and light scattering in dye-sensitized solar cells using oriented TiO₂ nanotubes arrays, *Nano Lett.*, 7 (2007) 69-74.