Tuning of physical-chemical properties of TiO_2 nanotubes for multifunctional applications

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Titanium dioxide nanotubes (TiO_2 NTs) have been widely investigated in the past twenty years due to the variety of possible applications of this material. Important characteristics of TiO_2 NTs are their high surface area and tuneable morphology. These can be combined with key features of TiO_2, such as biocompatibility and photo and electrocatalytic properties. This combination makes TiO_2 NTs perfect candidates for multifunctional applications ranging from biomedical application to sensing and energy devices [1].

Herein, we present TiO_2 NTs grown by anodic oxidation on top of a titanium foil in an EG-based electrolyte with NH_4F [2]. The as-grown amorphous nanotubes were morphologically characterized, as shown in Figure 1a-b. Additionally, the tuneable electronic properties (such as the bang gap, Figure 1c) were investigated varying the post-processing temperatures, while maintaining their amorphous nature.

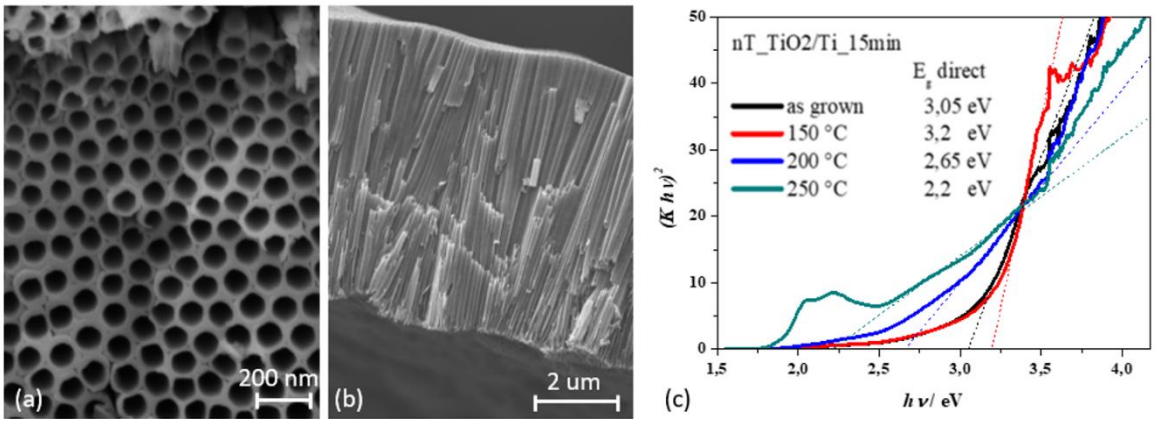

Figure 3: FESEM (a) top view and (b) cross view, (c) UV-VIS curves of the amorphous TiO_2 NTs.

[1] P. Roy, S. Berger, and P. Schmuki, *Angew. Chem. Int. Ed.* **50** (2011) 2904-2939.
[2] A. Lamberti, N. Garino, A. Sacco, S. Bianco, A. Chiodoni, and C. Gerbaldi, *Electrochim. Acta* **151** (2015) 222-229.