

Influence of Gold Additive on the Stability and Phase Transformation of Titanate Nanostructures

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1. HRTEM images of H-form nanotubes as a function of temperature

TEM images demonstrate the tubular morphology of the as-synthesized titanate nanotubes with a diameter of ~ 7 nm and length up to 80 nm. The acid washing process resulted in a mild destruction of the inner and outer nanotube walls (Fig. S1A). In agreement with the XRD results no morphological degradation could be observed after heat treatment up to 573 K. At higher temperatures the tubular structure started to collapse and transform into rod-like nanostructures. At 873 K the tubular morphology totally collapsed that resulted in short nanorods and TiO_2 nanoparticles with an average diameter of ~ 10 nm.

2. HRTEM images of H-form nanowires as a function of temperature

The titanate nanowire TEM results presented in Fig. S1B confirm that the wire-like morphology is preserved up to 873 K during heat treatment, and they also provide morphological evidence to support the hypothesis presented in the text about water loss being responsible for the appearance of textural discontinuities.

3. HRTEM images of Au containing (2.5 %) nanowires (obtained by NaBH_4 reduction) as a function of temperature

HRTEM images of gold-decorated H-form titanate nanowires subjected to annealing at different temperatures are shown in two resolutions (100 nm and 20 nm) in Fig. S2. A characteristic image of pristine H-form titanate nanowires is also presented as reference. In agreement with the XRD results, the HRTEM images have confirmed that the nanowires preserve their wire-like morphology up to 873 K. The morphology stabilization effect of gold was independent from the method used for its reduction. HRTEM results displayed in Fig. S2 show that the wire-like morphology is stable with the temperature even the gold nanoparticles were prepared by NaBH_4 reactant.

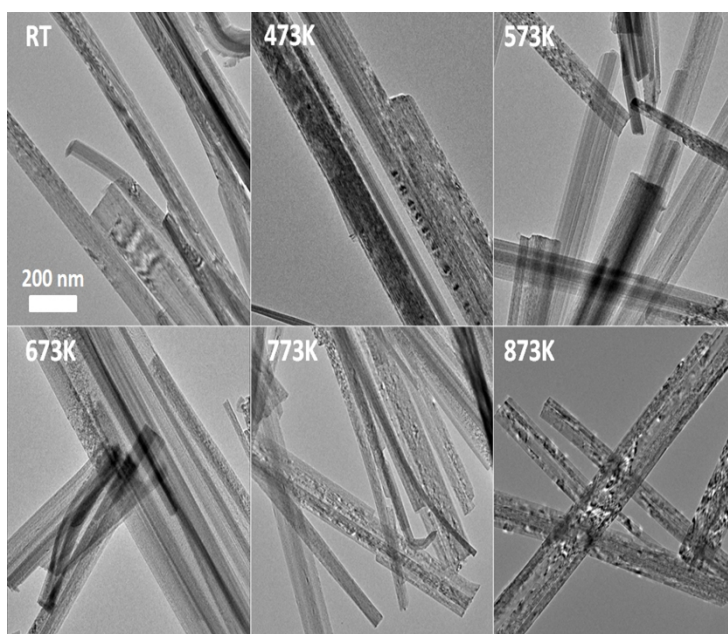
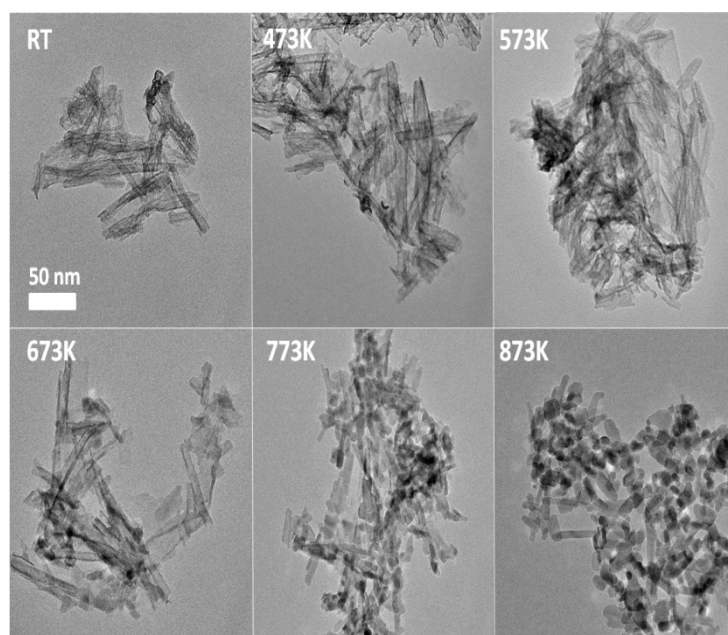


Figure S1 TEM images of H-form nanotubes (upper part) and H-form nanowires (lower part) at different temperatures.

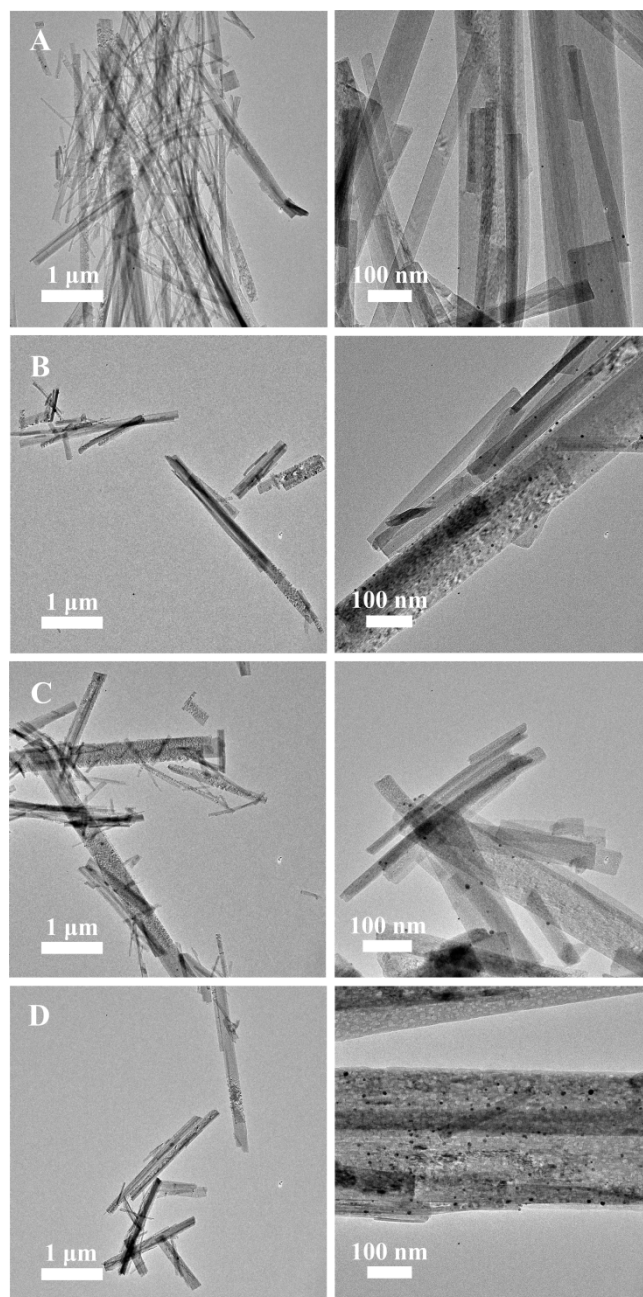


Figure S2 HRTEM images of Au containing (2.5 %) nanowires (obtained by NaBH_4 reduction). H-form titanate nanowires (A) and after different heat treatments; (B) – 473 K, (C)– 673 K, D – 873 K.