

Supporting Information

Chlorate Ion Mediated Rutile to Anatase Reverse Phase Transformation in the TiO₂ Nanosystem

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Supporting Information-I : Experimental

Our experiment involves two electrode assemblies consisting of a Ti foil (Alpha Aesar 99% pure, metal basis, thickness 0.5mm) as anode and a Pt foil as cathode, dipped in 1.4 M perchloric acid (Thomas Baker) in Deionized water. A high voltage of 8V is applied between the two electrodes for six hours. The Rutile nanoneedle powder is found to evolve dynamically from the surface of Ti foil due to a large current density of the order of 50-100 mA/cm² on the Ti foil surface, detaching from the surface and settling down in the solution.

The as-grown and annealed samples were characterized by various techniques such as X-ray diffraction (XRD, Philips X'Pert PRO,PAN Analytical diffractometer using Ni-filtered Cu-K α radiation, $\lambda=1.54\text{\AA}$), Micro Raman Spectrometry (Horiba Jobin Yuon), high resolution transmission electron microscopy (HRTEM, FEI, Technai F30, with 300 KV FEG), Ultraviolet-visible spectrometer (Varian, CARY100), Fourier transform infrared spectroscopy (FTIR Perkin Elmer Spectra One).

Supporting Information-II : Control Experiment of soaked rutile TiO₂

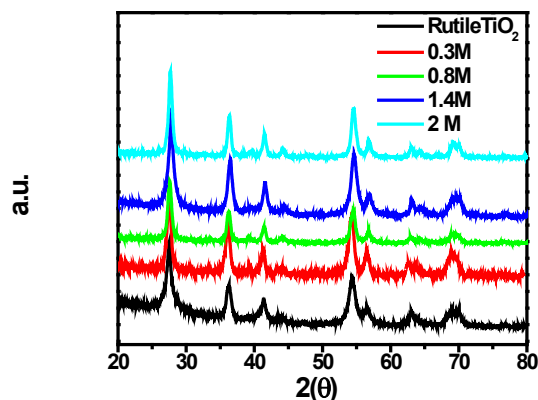


Fig 1.: XRD patterns of soaked rutile TiO₂ in different acid concentration

We performed a series of re-soaking experiments on fully washed rutile TiO₂ films in different concentrations (0.3M, 0.8M, 1.4M, 2M) of perchloric acid, followed by annealing at 300°C. We observed that in each case rutile TiO₂ was obtained. This implies that washing leads to irreversible changes in the TiO₂ octahedral conformations, which can not be reversed simply by re-soaking. Thus the phase transformation is strictly due to insitu ClO₄⁻ ions incorporated during the anodization process.