Supplementary Material (ESI) for Chemical Communications

Supporting Information

Nanoflower Arrays of Rutile TiO_2

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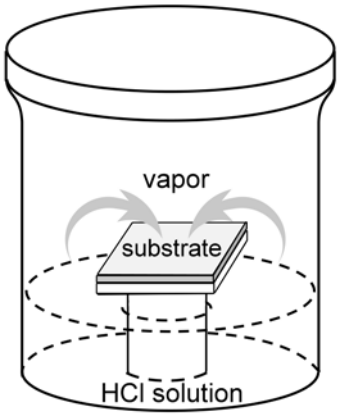
Experimental Section

Sample Preparation: Rutile TiO_2 nanoflower arrays were synthesized according to the procedure described in our previous report with a minor modification.[3] A ceramic corundum plate (*ca*. 8.0 × 8.0 × 1.0 mm) pre-cleaned using water and acetone in an ultrasonic bath was deposited with a titanium film (*ca*. 100 nm thick) by magnetron sputtering. As shown below, the substrate was placed on a flat column standing in a Teflon cup containing HCl solution (4.0 mL, 6.0 M). The substrate was above the surface of the solution to avoid being submerged. Placed in an autoclave at 140 °C for 6.0 hours, the ceramic plate was found covered with a white surface. Precautions should be observed for the safe handling of hydrothermal reactors in which gaseous molecules may be evolved. The plate was carefully taken out from the cup and washed with distilled water, followed by drying in a desiccator at ambient temperature. The effect of HCl concentration on the population of the nanoflower products was investigated. If the concentrations of HCl were reduced, more rutile nanorods were produced. The most densely populated arrays were formed by using 6 M HCl (Figure 1). An obviously lower population of R-TiO_2 nanoflowers was found when the reaction was carried out under 8 M HCl (Figure S2). Increasing the HCl concentration to 10 M or higher caused complete dissolution of the product. This acid concentration effect allows easy control of the density of the R-TiO_2 thin film on the ceramic corundum plate.



Characterization: The morphologies and structures of the as-prepared films were characterized by SEM (FEI Quanta 400 Thermal FE Environment Scanning Electron Microscope) and TEM (JEOL JEM-2010HR transmission electron microscope). A dried film for SEM observation was adhibited on

the copper platform and then sputter-coated with platinum. A TEM sample was prepared by scratching tiny amounts of powder off the substrate and dispersing the powder on a holey carbon film supported on copper grids. The dispersion of powder was carried out in an ultrasonic pool. Due to such a scratching and dispersing for TEM sample preparation, some branches might be distorted. For example, the structure shown in Figure 3a seems to have 7 branches from tilted top view while in the SEM image of Figure 1b, each has only 6 nanopetals.

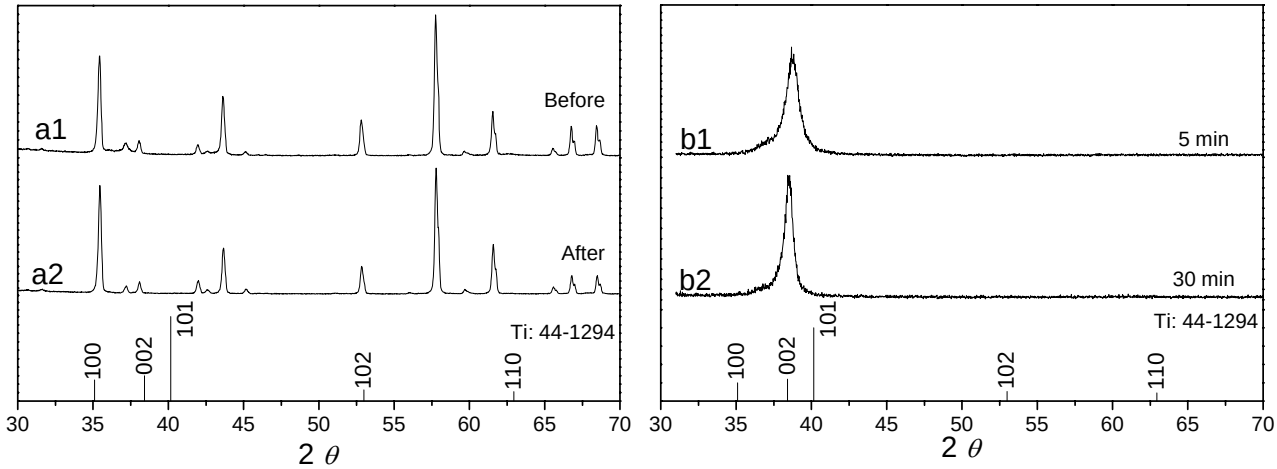


Figure S1 (a1, a2) XRD patterns of ceramic corundum plates before and after sputtered with titanium. Since the amount of titanium is so tiny, its diffraction signal cannot be resolved form the strong background of the highly crystalline ceramic substrate. (b1, b2) As an alternative, we used an amorphous glass plate with zero background as a blank substrate to sputter a titanium film under the same sputtering condition. From the XRD patterns of a glass plate sputtered for 5 and 30 min, it can be seen that the Ti films are highly 001 oriented.

Our previous work is cited in the manuscript as reference 3.

3. X. F. Yang, J. L. Zhuang, X. Y. Li, D. H. Chen, G. F. Ouyang, Z. Q. Mao, Y. X. Han, Z. H. He, C. L. Liang, M. M. Wu and J. C. Yu, *ACS Nano*, 2009, **3**, 1212-1218.

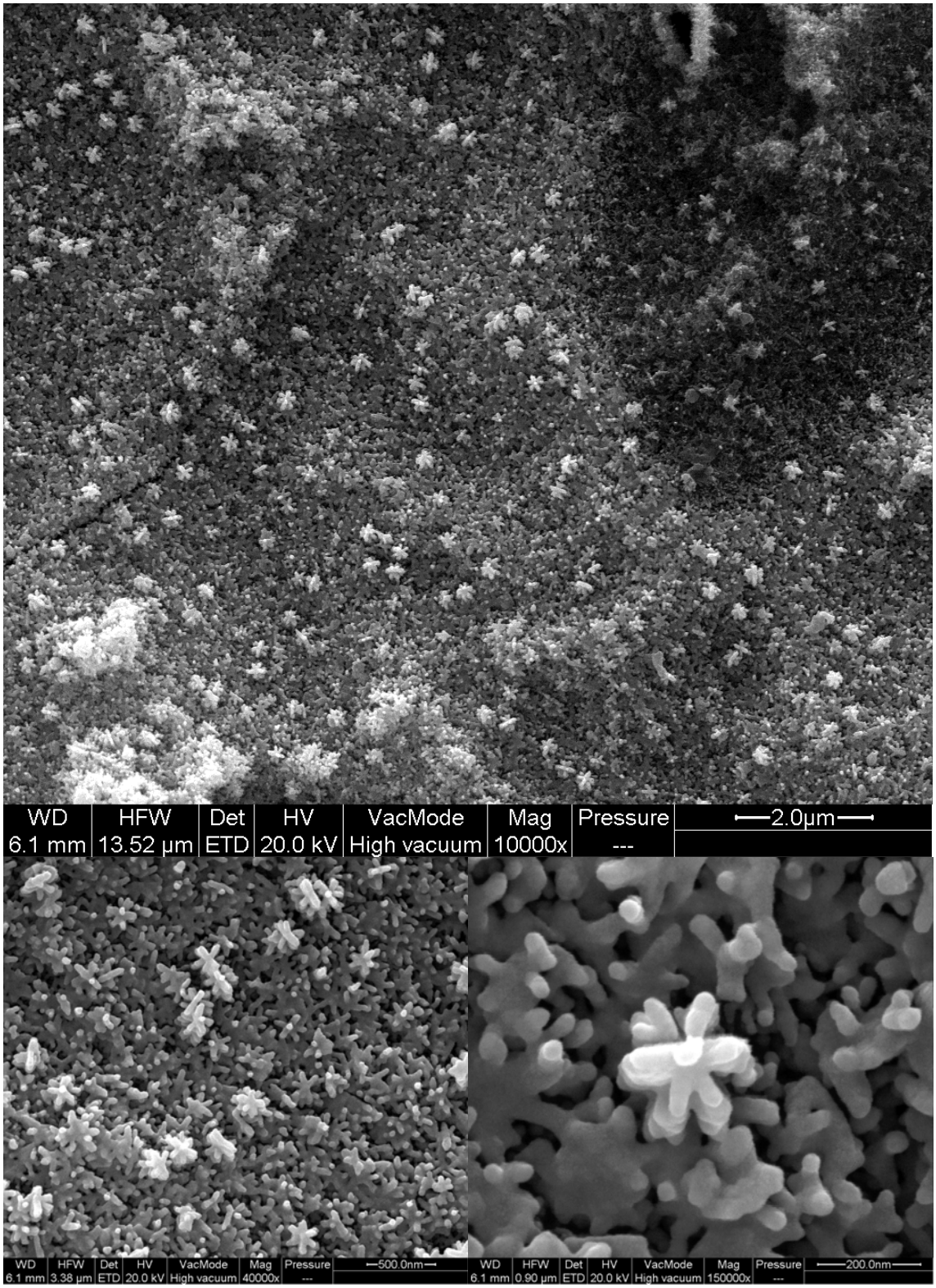


Figure S2 SEM images with different magnifications of R-TiO_2 nanostructures grown under 8 M HCl. The nanoflowers are obviously not densely populated as compared to that obtained under 6 M HCl.