

Supporting Information

Solution Plasma Process Derived Defect Induced Hetero-phase anatase:brookite TiO₂ Nanocrystals for Enhanced Gaseous Photocatalytic Performance

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S1. Experimental – sample information



Figure S1. Photographs of samples (a) untreated ST-1 TiO₂ and (b) SPP treated ST-1 TiO₂ (3 hrs).

S2. Crystal structure analysis:

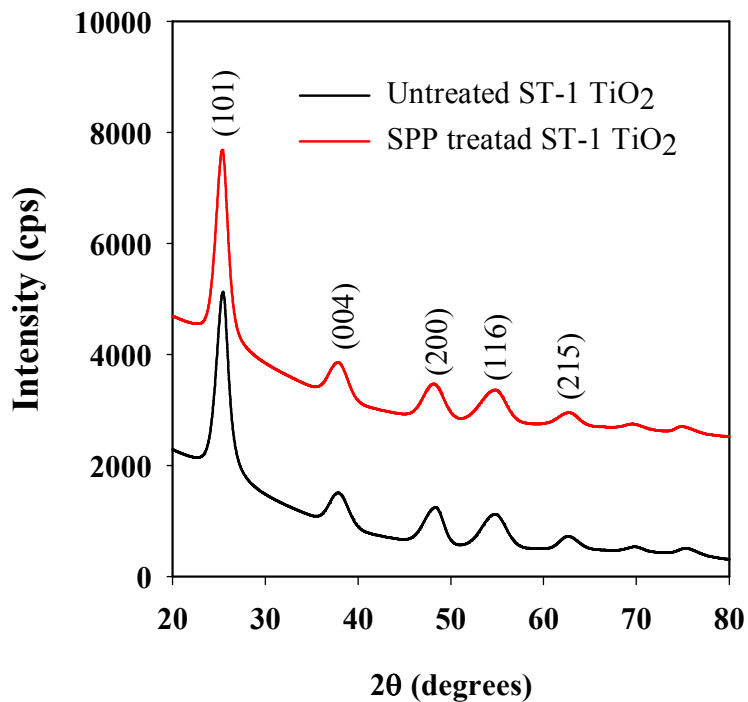


Figure S2. X-ray diffraction spectra of untreated and SPP treated ST-1 TiO₂.

From Figure S2, the observed peaks at 25.2° , 37.8° , 48.8° , 54.7° and 62.8° are corresponding to the (101), (004), (200), (116), and (215) crystalline phase of anatase TiO₂ (JCPDS 00-021-1272). There is no significant difference between untreated and SPP treated ST-TiO₂ sample is identified.

S3. Crystal lattice analysis

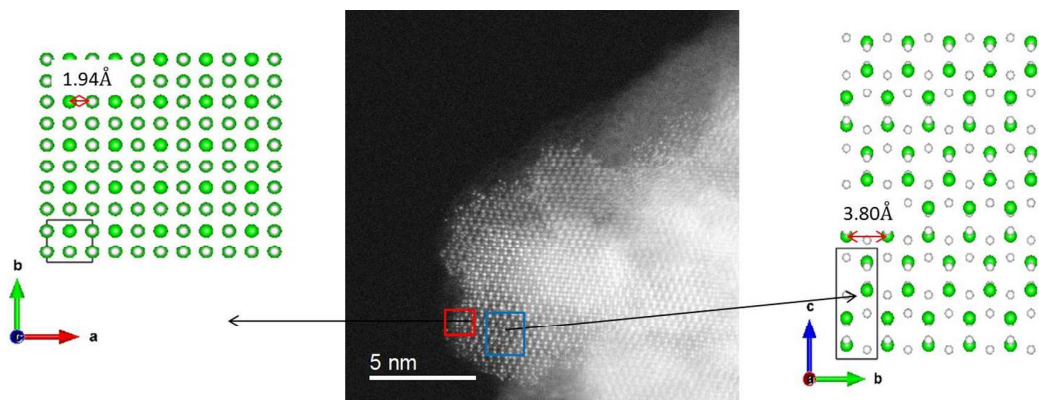


Figure S3. HAADF image of SPP treated ST-1 TiO₂. The lattice diameter of two different places indicated in red and blue color box were obtained through simulation.

S4. Crystal lattice analysis:

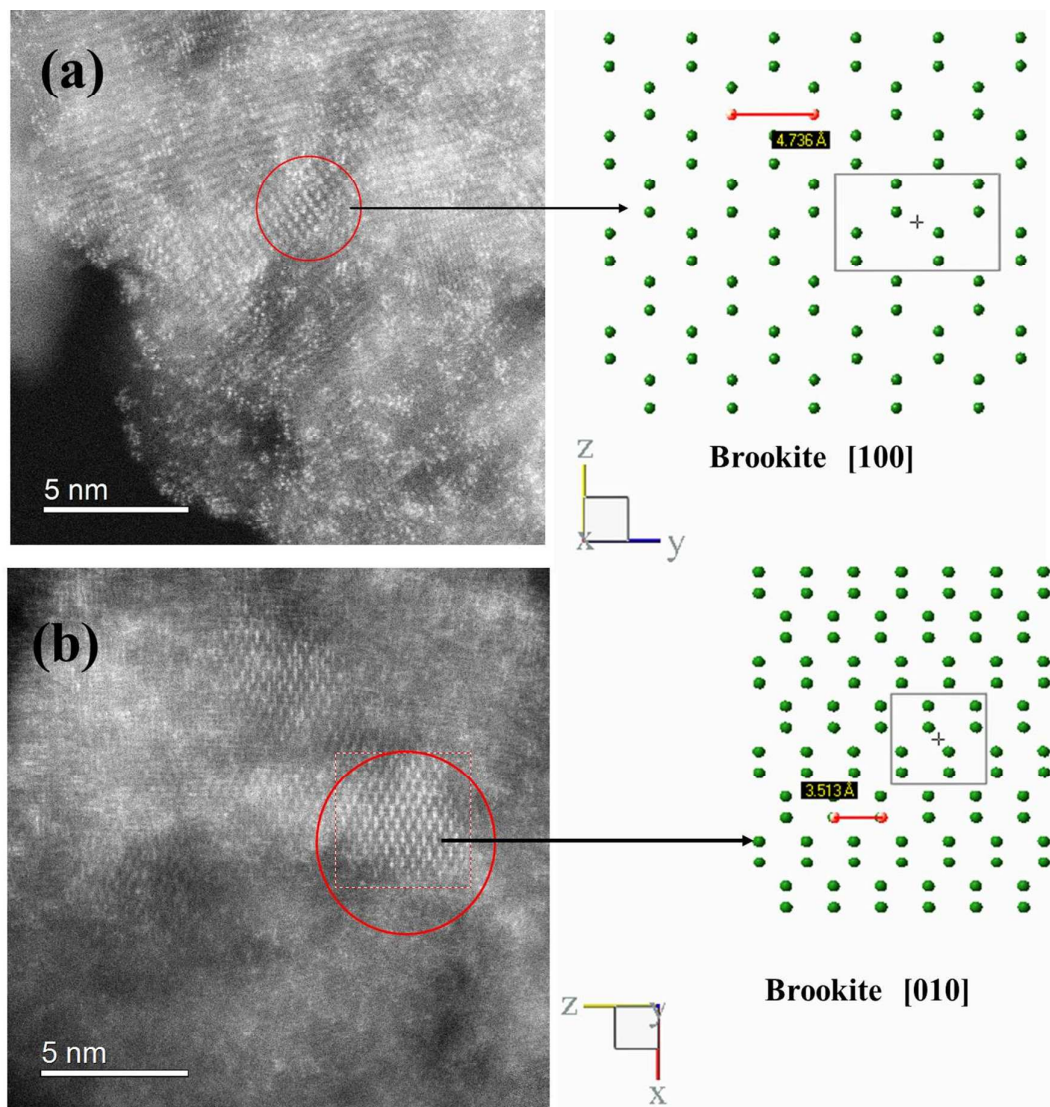


Figure S4. HAADF images of SPP treated ST-1 TiO₂. The lattice diameter values of circled places in both (a) and (b) are obtained through simulation.

S5. Crystal lattice analysis:

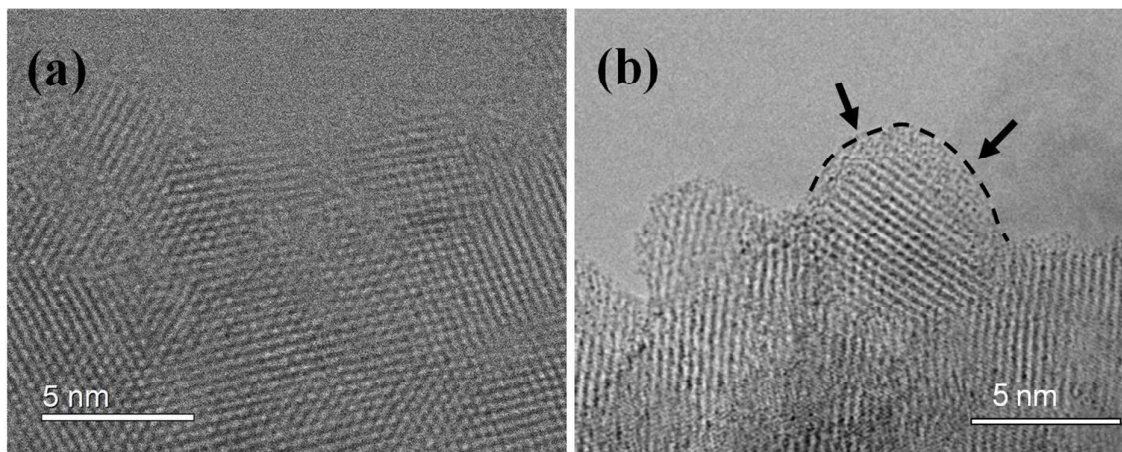


Figure S5. HAADF-STEM images of (a) untreated ST-1 TiO_2 and (b) SPP treated ST-1 TiO_2 (3 hrs). Note that dotted line in Figure S5 (b) indicates the amorphous TiO_2 layer induced by hydrogen radical from solution plasma processing technique.

S6. Defect analysis

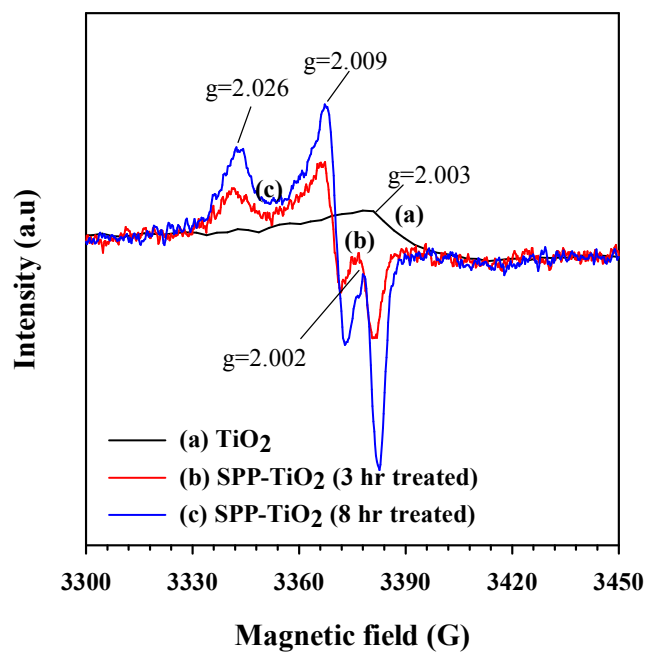


Figure S6. ESR spectra of untreated and SPP treated ST-1 TiO₂ samples.

S7. Surface area analysis

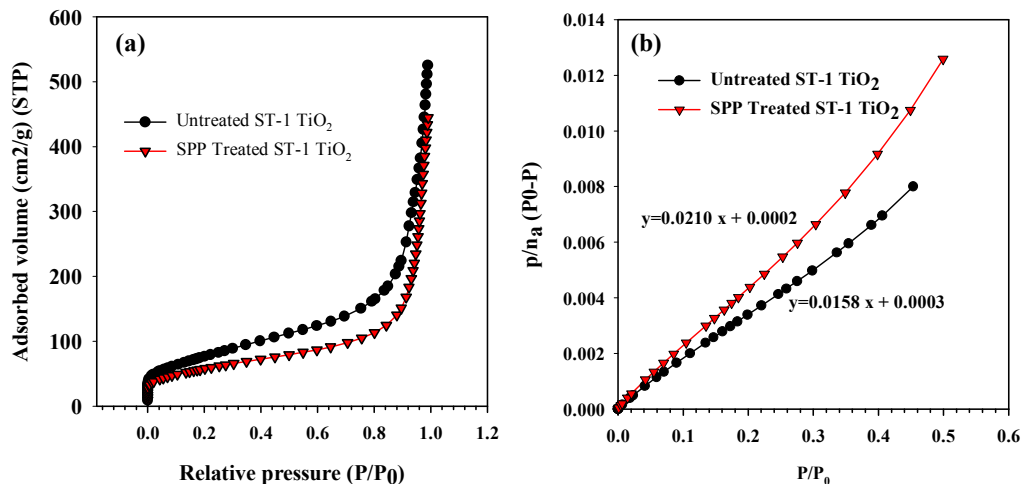


Figure S7. BET nitrogen adsorption isotherm pattern of untreated and SPP treated ST-1 TiO₂.

Table S1. Surface area analysis of untreated and SPP treated ST-1 TiO₂ powder samples.

Experiment condition	Surface area (m ² /g)
Untreated	276
3 hr SPP treatment	221
8 hr SPP treatment	206
15 hr SPP treatment	172

S8. Optical analysis

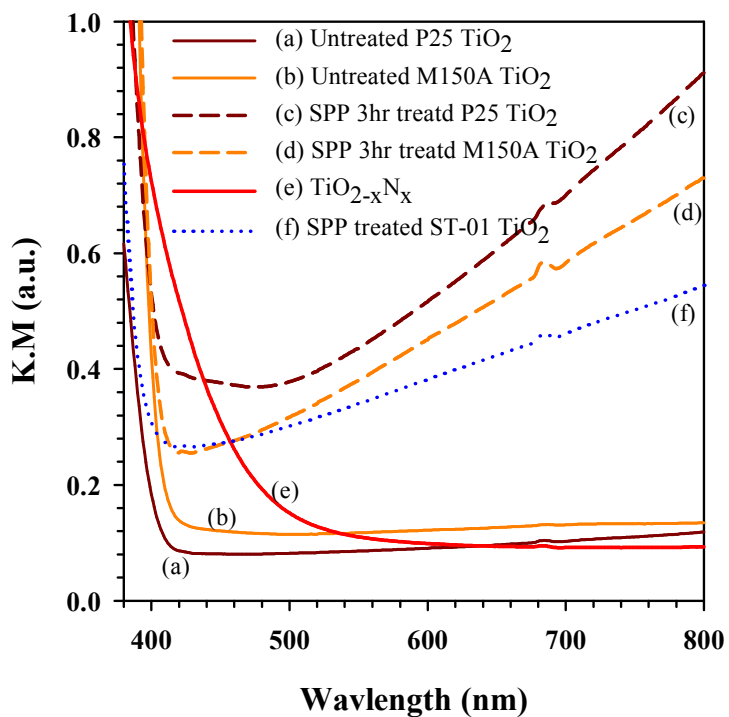


Figure S8. Optical absorbance spectra (Kubelka-Munk) of untreated and SPP treated TiO₂ samples. Note that untreated nitrogen doped TiO₂ (TiO_{2-x}N_x) is compared in this spectra.

S9. Light irradiation wavelength dependence photocatalytic activity

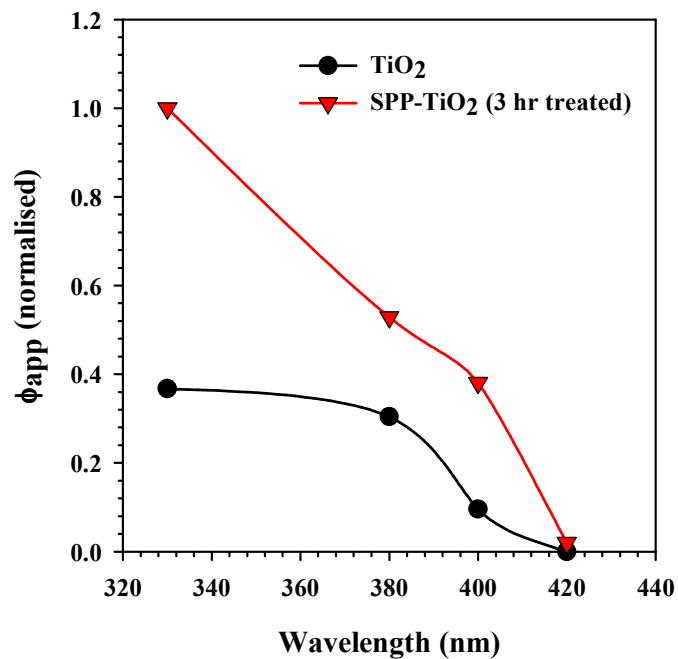


Figure S9. Comparison of photocatalytic acetaldehyde degradation between untreated and SPP treated ST-1 TiO_2 sample at different wavelength of light irradiation.