Electronic Supplementary Material (ESI) for RSC Advances

Supporting Information for

Low-temperature synthesis of stable nanoTiO$_2$/rGO composite colloids and their application in photoelectric films

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1. Photocatalytic performance measurement:

Photoelectrochemical test systems were composed of a CHI 660D Electrochemical Analyzer, a 350 W xenon lamp, and a homemade electrochemical cell. A series of nanoTiO_2/rGO films deposited on ITO-PET with same amount of nanoTiO_2 and different amount of rGO were prepared using scotch-tape method. The as-made films were fixed in a specially designed sample holder with a hole in diameter of 2 centimeters to let light in for measurements. We employed the nanoTiO_2/rGO films as photoanodes, Pt as counter electrode, and Na_2SO_4 (0.5 M) as electrolyte.

2. Decomposition of the gas-phase acetaldehyde:

The details of the acetaldehyde decomposition experimental procedure were showed in the following experimental flow chart:

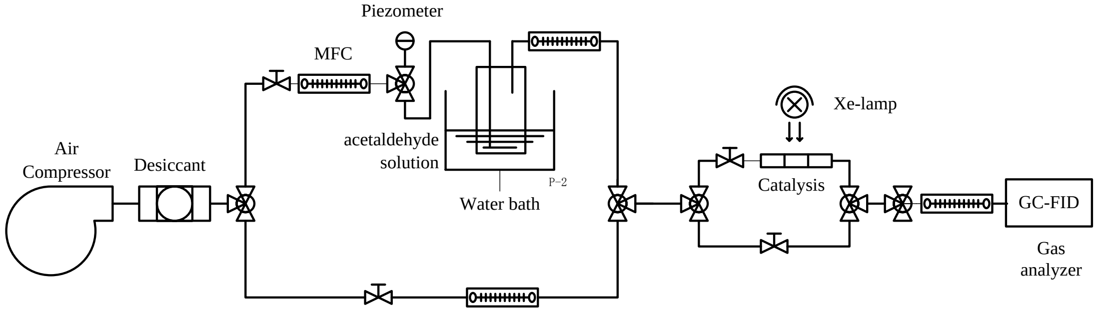

Figure S1. The flow chart of the acetaldehyde decomposition experiment.

3. Material preparation

	TiO_2	Sample A	Sample B	Sample C	Sample D	Sample E	Sample F
DI water (ml)	150	143.75	137.5	125	100	50	0
$Ti(OBu)_4$ (ml)	1	1	1	1	1	1	1
PrOH (ml)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
GO (ml)	0	6.25	12.5	25	50	100	150

Table S1. The amount of GO, $Ti(OBu)_4$, PrOH, DI water used for preparing nanoTiO_2/rGO composites colloid. The GO concentration is 0.5mg/ml.

4. Related analysis of the materials

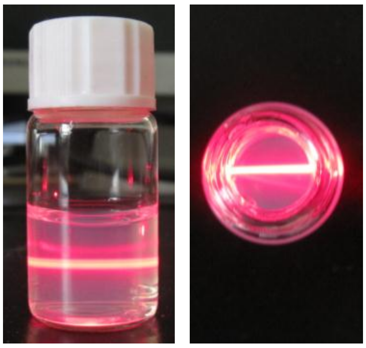

Figure S2. The Tyndall effect of nanoTiO_2 colloid.

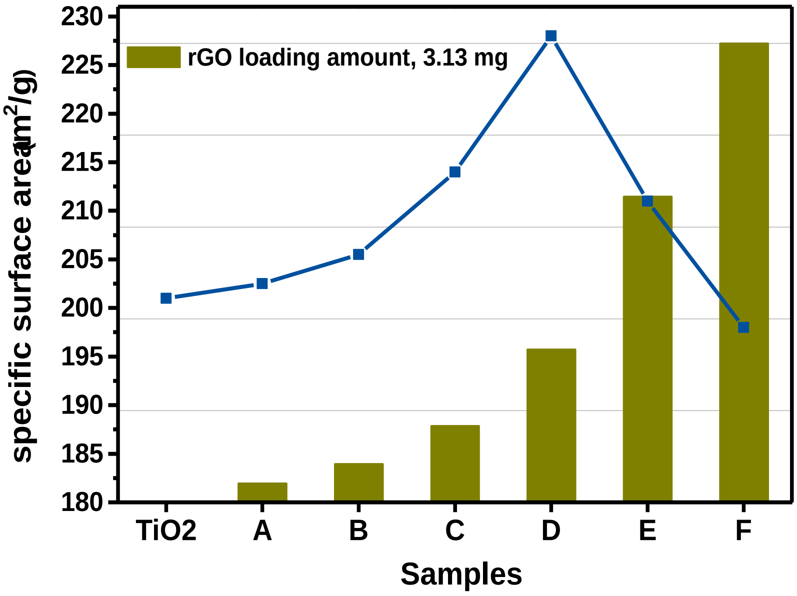

Figure S3. Specific surface area of nanoTiO_2/rGO composites A-F.

After dried the samples at 50° C for 36 h, we tested the specific surface area of the powder using N_2-BET. Fig S2 shows the results. Ascribe to the nanometer particle size, the specific surface area of TiO_2 particles we synthesized at low temperature is about 200 m^2/g, much higher than commercial Degussa P25 TiO_2 (the surface area of P25 samples is 47m^2/g). Loading proper quantity of graphene will increase the specific surface area, but excessive graphene will decrease the surface area. High specific surface is very important to DSSCs because it means being able to absorb more dye.

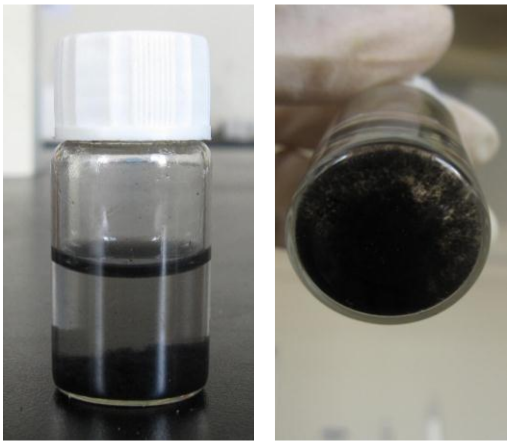

Figure S4. Prepare nanoTiO_2 and GO colloid separately and then mixed together, the stability of the colloid would immediately be destroyed.

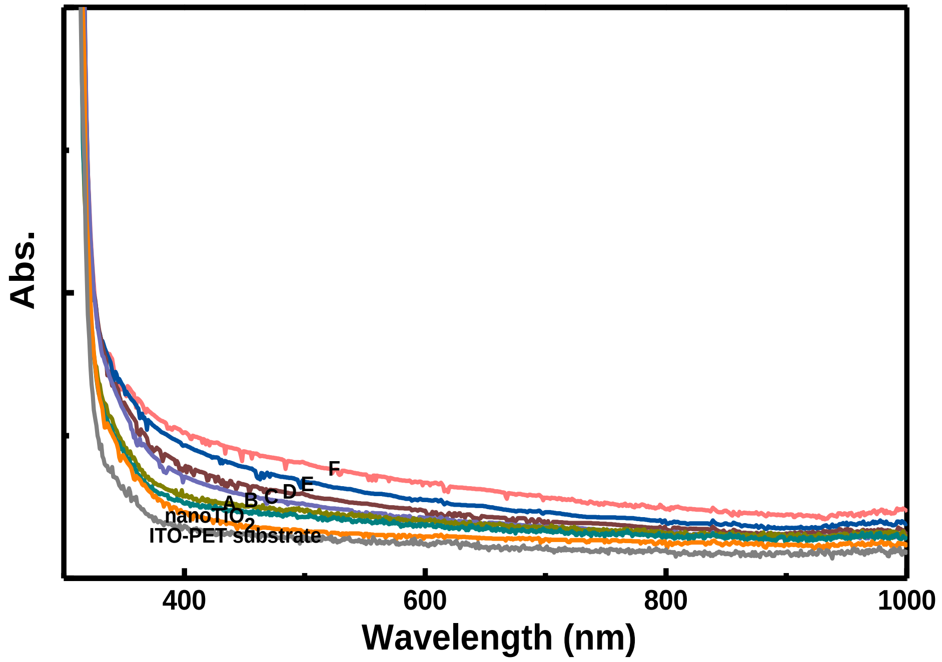

Figure S5. UV-vis absorption spectrum of the films deposited on PET using nanoTiO_2/rGO colloid, sample A-F. Because the color of rGO is black, the absorption of the sample films increased with graphene loading amount increasing. To reference, the UV-vis spectra of ITO-PET substrate is also shown.