

**S-doped mesoporous nanocomposite of HTiNbO<sub>5</sub> nanosheets and TiO<sub>2</sub> nanoparticles with an enhanced visible light photocatalytic activity**

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**Table S1. Summary of optical power and power density**

$d^a$ (cm)	Optical power (mW)	Optical power density (mW/cm <sup>2</sup> )
1	475	633
2	451	602
3	430	573
4	406	541
5	380	506
6	358	477
7	334	441
8	313	416
9	291	389
10	255	352

<sup>a</sup>  $d$  means the distance between thin film filter and the probe of CEL-NP2000. The starting upper and lowest liquid surfaces of dye solution are about 3 and 9 cm apart from filter in the photocatalytic tests, respectively.

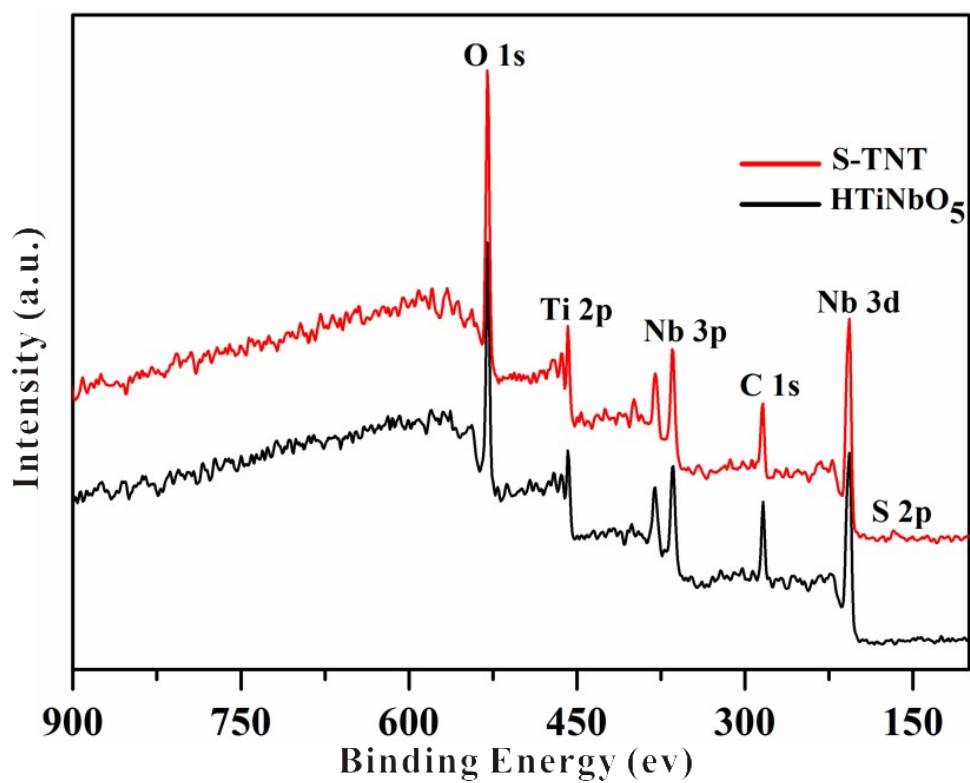
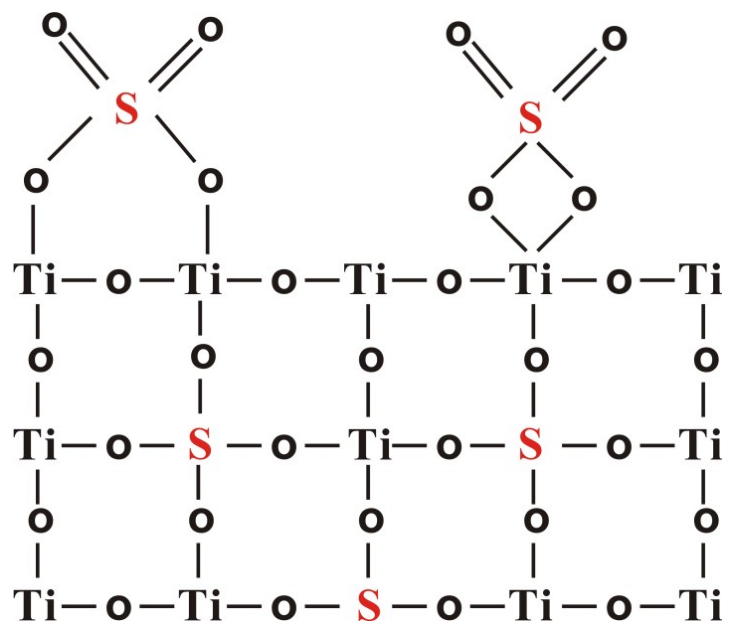
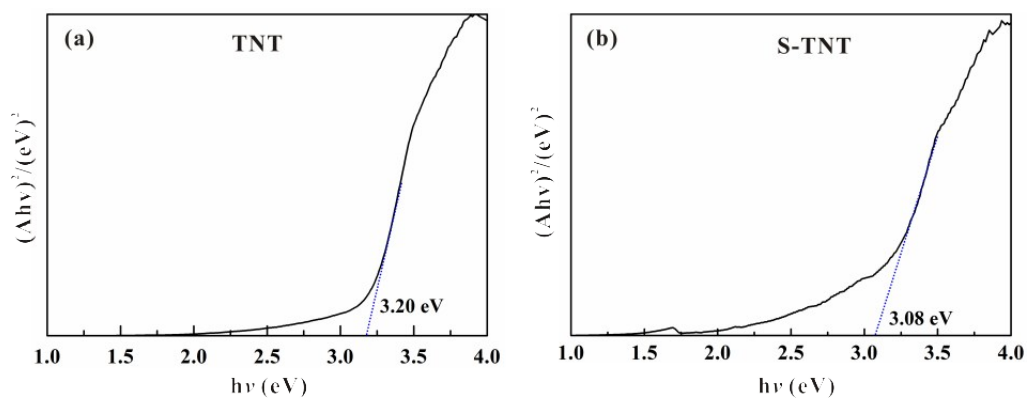


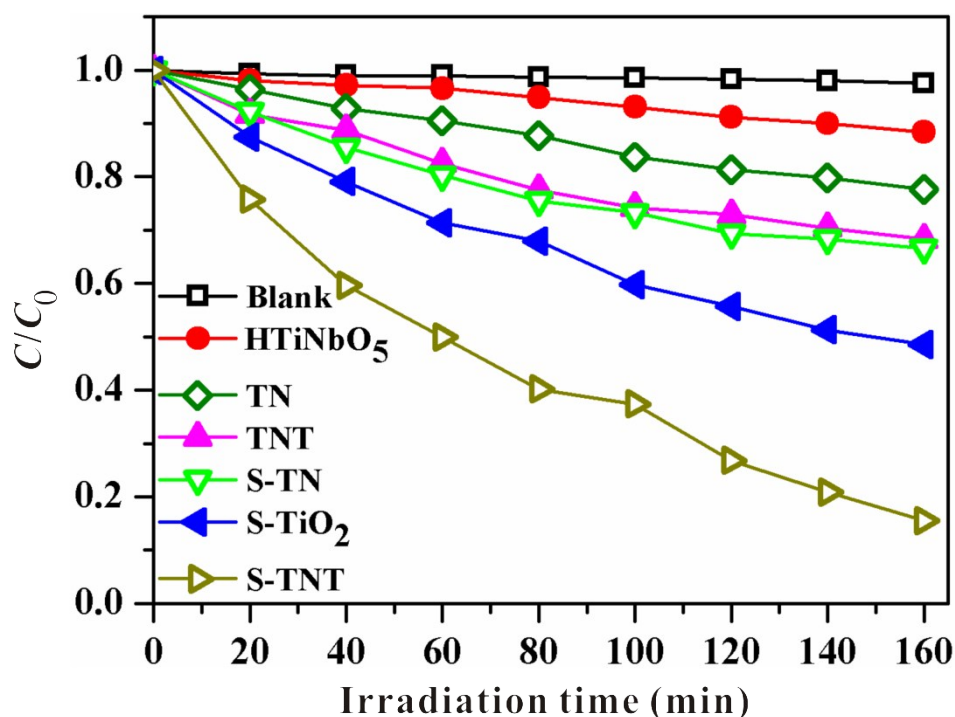
Figure S1 XPS total spectra of HTiNbO<sub>5</sub> and S-TNT.



**Figure S2** Two possible structures of the surface-adsorbed sulfate groups in S-TNT.



**Figure S3** The relationship between  $(Ahv)^2$  and photo energy ( $hv$ ) of TNT and S-TNT.



**Figure S4** Visible light photocatalytic degradation rate of phenol solution over different samples.

The visible light photocatalytic activities of the resulted samples were also evaluated by the degradation of phenol aqueous solution. The photocatalytic degradation of phenol was monitored by the blank test. It was found that self-degradation of phenol was not observed under visible light irradiation. The photocatalytic degradation rate over HTiNbO<sub>5</sub> and TN is very slow, and only 11.6% and 22.3% of phenol are degraded under visible light irradiation within 160 min, respectively. The corresponding degradation is mainly attributed to the self-sensitization oxidation and surface adsorption, as both HTiNbO<sub>5</sub> and TN have a large band-gap and cannot be activated by visible light.

Compared with TN, both S-TN and TNT show an enhanced visible light photocatalytic degradation rate of phenol, which is respectively due to S doping and the formation of nano-heterojunction between HTiNbO<sub>5</sub> NSs and TiO<sub>2</sub>. Furthermore, after hybridization and S doping, a significantly enhanced photocatalytic performance is observed with S-TNT, showing the highest photocatalytic activity with 84.5% of RhB photodegraded in 160 min. It indicates that S doping essentially tunes the electric structure of TNT and thus further effectively enhances the photocatalytic performance. In addition, compared with S-TN and S-TiO<sub>2</sub>, the enhanced photocatalytic activity of

S-TNT also proves the importance of the formation of nano-heterojunction in enhancing the photocatalytic performance. Combined with the results from XPS, EPR and UV-vis spectra, the observed photobleaching over S-TNT under visible light irradiation should be mainly attributed to the oxidation photodegradation of dye molecules rather than the self-photosensitized oxidation or other reasons.