

Supporting information for

Constructing an S-Scheme NiO/SrTiO₃ Heterojunction for Highly Enhanced Visible- Light Photocatalytic Removal of Methylene Blue

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Trapping Experiment

In the radical trapping experiments, isopropanol (IPA) and benzoquinone (BQ) were employed as scavengers for hydroxyl radicals ($\bullet\text{OH}$) and superoxide radicals ($\bullet\text{O}_2^-$), respectively. Specifically, 1.0 mL of IPA (corresponding to a concentration of approximately 0.26 mol L^{-1}) and 4 μL of BQ (final concentration of 1 mmol L^{-1}) were added into the reaction system prior to light irradiation. 50 mg of the photocatalyst was dispersed in a quartz glass reactor containing 50 mL of an aqueous methylene blue (MB) solution (initial concentration: 10 mg L^{-1} , $\text{pH} = 7$). A 500 W xenon lamp was used as the simulated solar light source. The mixture was first stirred in the dark for 30 min to establish an adsorption-desorption equilibrium. During the illumination period, approximately 3 mL of the suspension was sampled at 3-min intervals and immediately filtered through a syringe filter with a $0.22 \mu\text{m}$ membrane to remove the catalyst particles. The degradation of methylene blue was evaluated by monitoring the decrease of its characteristic absorption peak at 667 nm using a UV-Vis spectrophotometer.

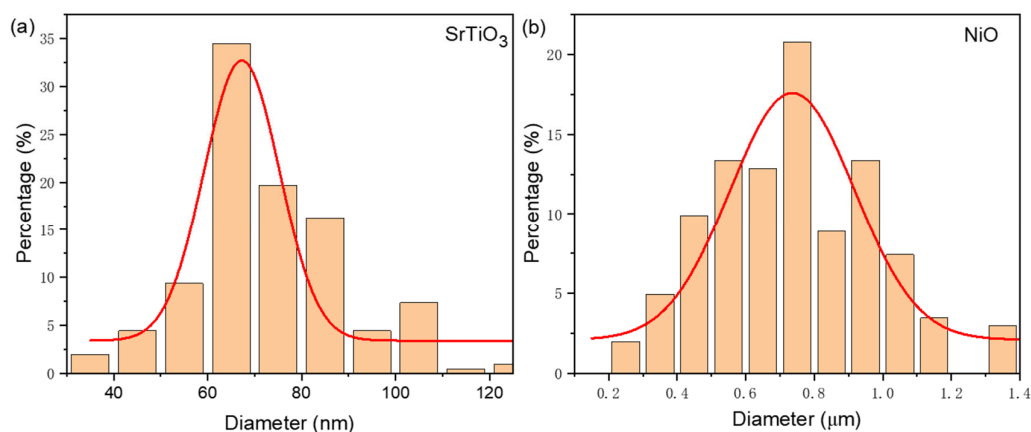


Figure S1 Statistical analysis of particle size: (a)SrTiO₃; (b)NiO

To further quantify the particle size of the samples, systematic particle size statistical analysis (statistical sample size > 200) was performed based on SEM images for SrTiO₃ and NiO sample. The particle size distribution histograms (Figure S1) indicate that the SrTiO₃ particles possess an average size of approximately 60 nm, exhibiting a relatively uniform nanoscale distribution. In contrast, the NiO component predominantly forms plate-like structures with characteristic dimensions of approximately 700 nm. This hierarchical size distribution is beneficial for photocatalytic performance. The nanoscale SrTiO₃ provides a high specific surface area and abundant active sites, while the larger NiO plates facilitate effective interfacial contact and charge transport.

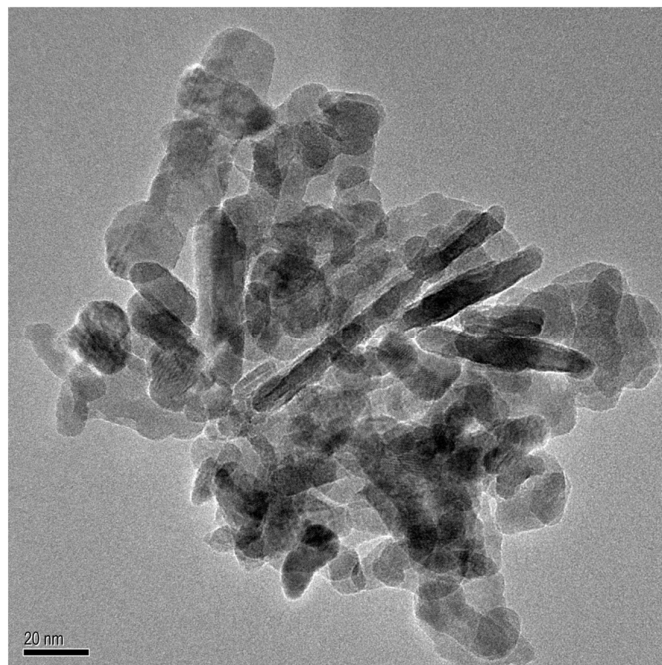


Figure S2 The TEM image of SrTiO₃ sample.

The TEM image of the SrTiO₃ sample (Figure S2) further confirms the short rod-like morphology and dense aggregation of the SrTiO₃ particles. The relatively small particle size implies the presence of abundant exposed surface active sites.

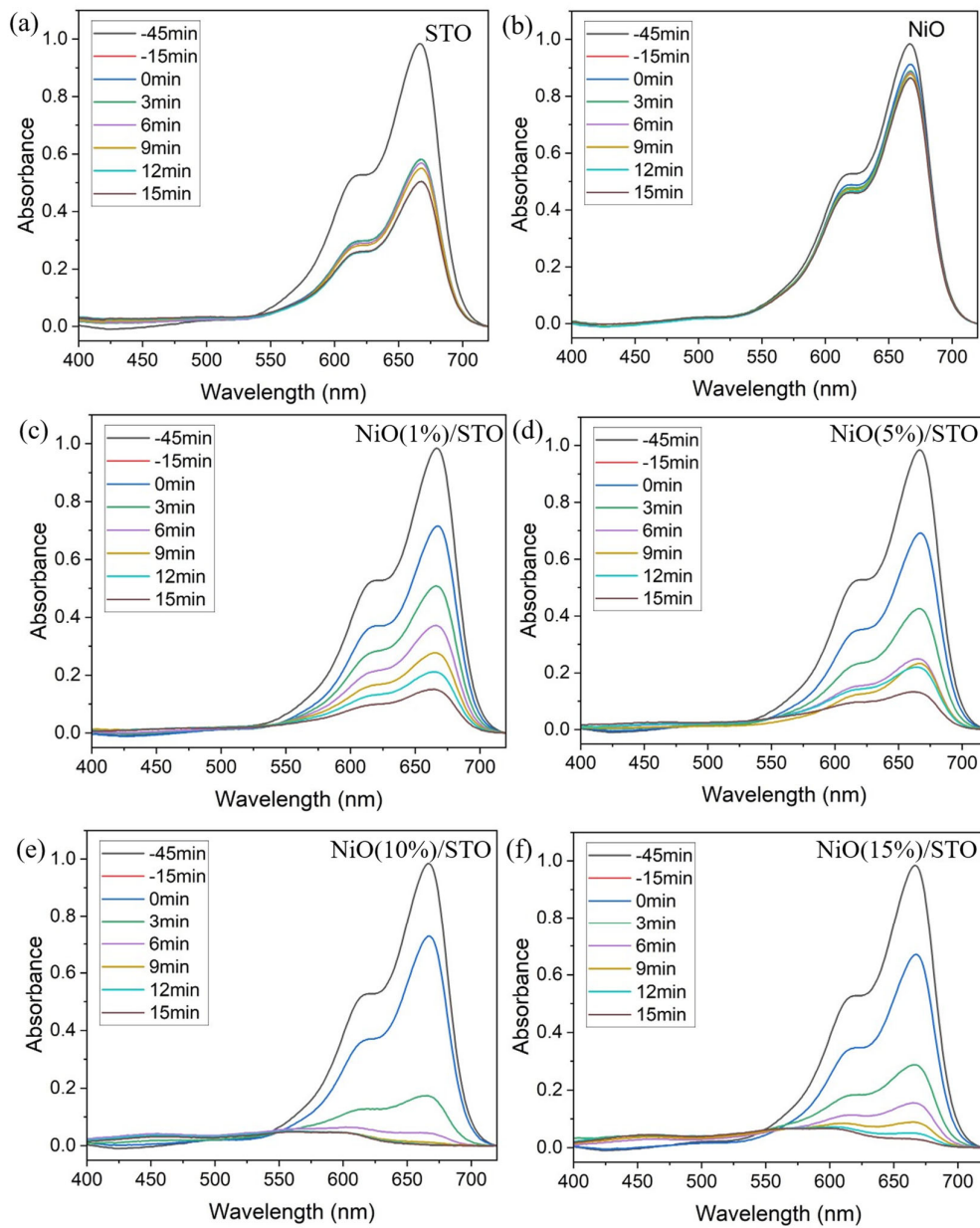


Figure S3 Photocatalytic degradation performance of NiO/SrTiO₃ samples: (a) SrTiO₃; (b) NiO; (c) NiO(1%)/SrTiO₃; (d) NiO(5%)/SrTiO₃; (e) NiO(10%)/SrTiO₃; (f) NiO(15%)/SrTiO₃.