**Supporting Information**

**Precise Regulation of Ultra-thin Pt Decorated Au/g-C3N4 Photocatalysts by**

**ALD for Efficient Degradation of RhB under Simulated Sunlight**

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**Fig.S1** Degradation efficiency of RhB with different catalyst dosage under sunlight irradiation



**Fig.S2.** The adsorption behaviors of C3N4-Au/10Pt for RhB

The adsorption behaviors of C3N4-Au/10Pt for RhB was investigated. The experiment results showed that the adsorption and desorption of RhB by the C3N4-Au/10Pt reached equilibrium after 20 min.



**Fig.S3.** Photodegradation of RhB in the presence of C3N4-Au/10Pt at different pH values (The pH of acidic, neutral and alkaline RhB reaction solutions is 1.5, 7.0 and 11.0, respectively).

In order to deeply investigate the excellent photocatalytic activity of C3N4-Au/10Pt at different pH values, the photocatalytic performance of C3N4-Au/10Pt under different pH values were studied. As shown in Figure S3, for C3N4-Au/10Pt sample, the photodegradation efficiencies were ~100% (pH = 1.5, within 20 minutes), ~94.9% (pH = 11.0, within 30 minutes) and ~86.3% (pH = 7.0, within 30 minutes), respectively. The differences of degradation efficiencies at the different pH values may be ascribe to the effect of H+ or OH− on the production of the reactive species (·OH, ·HO2, ·O2− and h+), because these species involved in photocatalysis and were of great importance for photodegrade reactions (Fei et al., 2016, Qingyong et al., 2017).

**Table S1.** Comparison of photocatalytic activities for the degradation of RhB

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| catalyst | Visiblelamp | Catalyst dosage (g) | RhB (mg⋅L-1) | Solution volume (L) | Degradation rate | Degradation time | Ref. |
| TCN(Ta2O5/g-C3N4) | 300 W | 0.10  | 10  | 0.1 | ~100% | 20 min | (Xin et al., 2016) |
| 0.5%CQDs/g-C3N4 | 250 W | 0.05  | 10  | 0.1 | 95.2% | 210 min | (Yuanzhi et al., 2016) |
| g-C3N4/Bi4O7 | 500 Whalogen lamp | 0.08  | 4.8  | 0.08 | ~100% | 70 min | (Meng et al., 2017) |
| Bi2WO6/g-C3N4 | 300 W | 0.05  | 20  | 0.05 | 92.51% | 50 min | (Mingjuan et al., 2019) |
| 2D/2D BiVO4/g-C3N4 | 300 W | 0.01  | 20  | 0.02 | ~100% | 60 min | (Zhichao et al., 2018) |
| Au@C/g-C3N4 | 300 W |  | 10 |  | 94.3% | 120 min | (Xixian et al., 2020) |
| Fe2O3/g-C3N4 | 65 W CFL lamp | 0.003  | 5 | 0.01 | 97.4% | 140 min | (Jasminder and Soumen 2020) |
| RTCN(N-HtiNbO5/g-C3N4) | 300 W | 0.1  | 1  | 0.2 | ~95% | 60 min | (Chao et al., 2020) |
| UCNA(ultrathin-g-C3N4/AgI) | 500 W | 0.02  | 20  | 0.03 | ~100% | 60 min | (Hao et al., 2021) |
| 2% ZnO/TiO2 | 200 W | 0.05 | 10 | 0.1 | 94% | 45 min | (Yingming et al., 2021) |
| ZnO/Ag | 300 W  | 0.03 |  | 0.1 | 100% | 30 min | (Liu et al., 2021) |
| C3N4-Au/10Pt | **300 W** | **0.0015**  | **10** | **0.1** | **~100%** | **65 min** | **This work** |

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