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Supplementary Information

One step synthesis of efficient photocatalysts by TCAP doped g-C_3N_4 for enhanced visible-light photocatalytic activity

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A Bruker Dimension Icon atomic force microscope was used to determination the thickness of g-C3N4 and CN/TCAP-100. The results are shown in Fig.S1. The g-C3N4 showed a thickness of ~7.0 nm (Fig.S1a, b), while CN/TCAP-100 showed a thickness of ~2.0 nm (Fig.S1c, d).

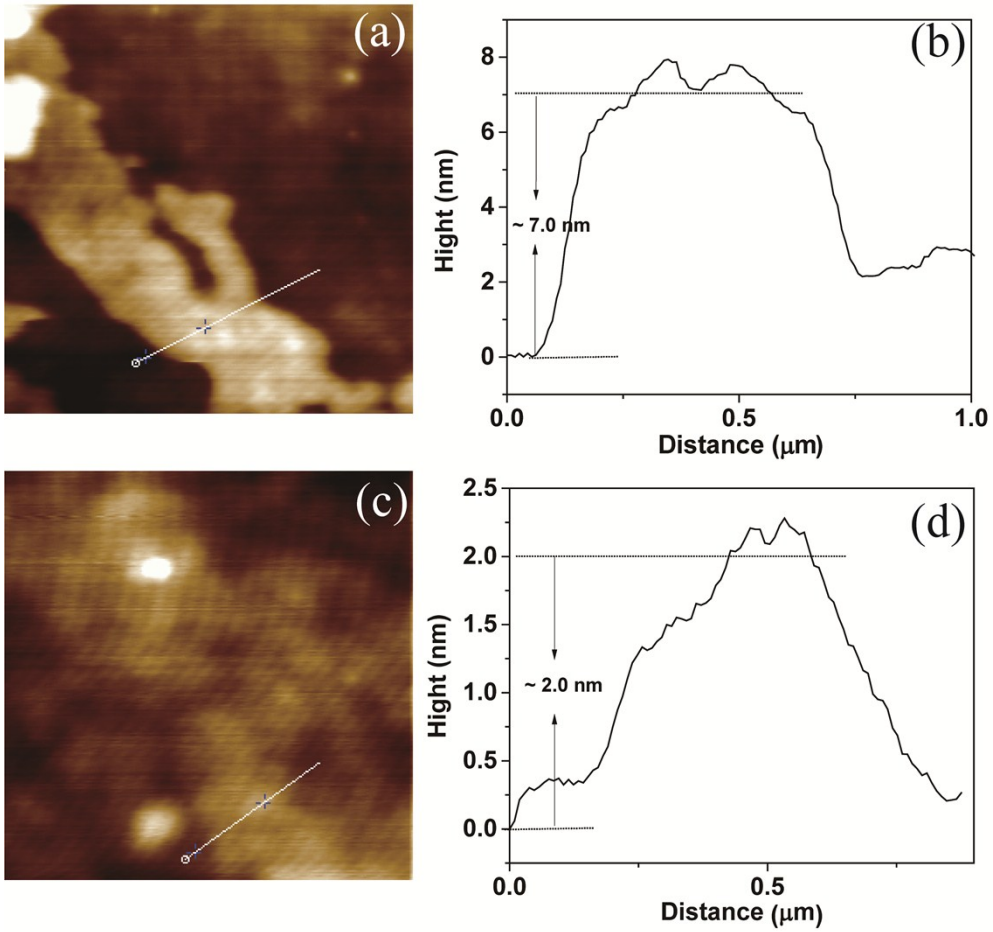

Fig.S1. (a, b) AFM image and cross-section profile of g-C3N4; (c, d) AFM image and cross-section profile of CN/TCAP-100

The photocatalytic degradation performance of CN/TCAP-100 at different initial concentration of OR-II solution (5 mg L^{-1}, 10 mg L^{-1}, 15 mg L^{-1}, 20 mg L^{-1} and 25 mg L^{-1}) is shown in Fig.S2.The results showed that the degradation rate decreased with the increase of initial dye concentration. When the concentration was 5 mg L^{-1}, the degradation rate was the best, and the degradation rate of 60 min could reach 96%. When the initial concentration was 25 mg L^{-1}, the degradation rate was the lowest, and the degradation rate was only 38% at the same time. This is because when the dye concentration is low, the probability of contact between the dye analysis and the photocatalyst increases, and the active material generated on the surface of CN/TCAP-100 is fully utilized. As the concentration increases, the amount of active

material produced by a certain mass of catalyst in a certain period of time does not change, and the concentration continues to increase, which is not enough to degrade the high concentration of the dye, thereby reducing the degradation rate.

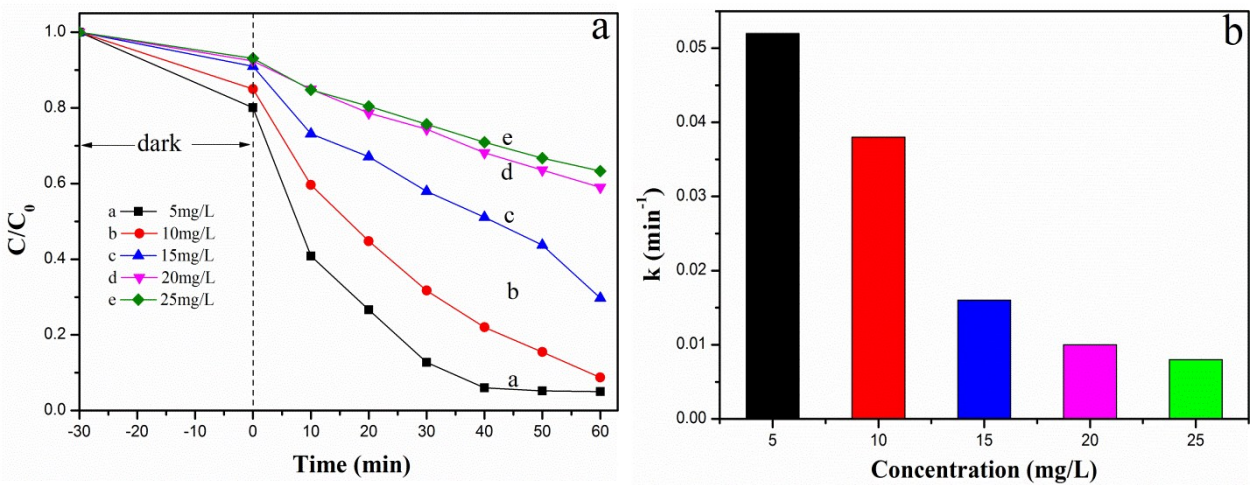

Fig.S2. (a) Photocatalytic degradation and (b) degradation rate of CN/CTAP samples with different initial concentration.

The degradation effect of photocatalyst CN/TCAP-100 (10mg, 20mg, 30mg, 40mg, 50mg, and 60mg) in light irradiation for 60min was investigated by using 100mL 10mg L^{-1} OR-II solution as photodegradation solution. The results are shown in Fig.S3. The results show that with the increase of photocatalyst dosage, the degradation efficiency of organic dye solution also increases. This is due to the increase of the amount of catalysts involved in the reaction, the amount of oxidizing active substances produced under visible light and photogenerated electrons and holes also increases, which leads to the increase of photodegradation rate. At the same time, we noticed that when the amount of catalyst increased to a certain extent, the trend of the change of photodegradation rate was decreasing. The reason was that for a certain concentration of organic dye (10 mg L^{-1}), the proper amount of catalyst has the best degradation effect. On the contrary, increasing the input amount will cause too much catalyst particles in the reaction system, and will obviously reflect and scatter effect on visible light. The effect of reducing the absorption of visible light by the solution leads to a decrease in the utilization of visible light by CN/TCAP-100 and a decrease

in the degradation ability.

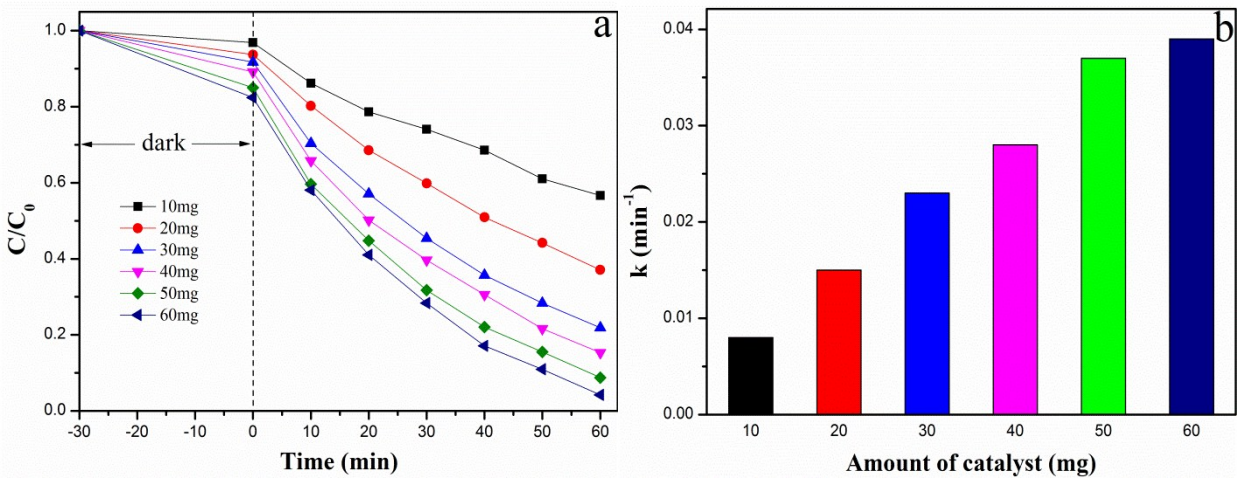

Fig.S3. (a) Photocatalytic degradation and (b) degradation rate of CN/CTAP samples with different catalyst content.

As shown in Fig.S4, the experiment of degradation of OR-II by light irradiation using CN/TCAP-100 as catalyst was carried out at different temperatures (15°C, 25°C, 35°C, 45°C, 55°C). The initial concentration of OR-II was 10 mg L^{-1} and the illumination time was 60 min. It can be seen from the figure that the effect of temperature on photocatalysis is not significant, and the degradation rate decreases with increasing temperature, indicating that low temperature is favorable for degradation. The activation energy of semiconductor photocatalytic reaction is generally low, and the catalytic reaction is not very sensitive to the temperature of the reaction system. Therefore, the reaction steps of photocatalytic degradation of organic pollutants affected by temperature are mainly adsorption, desorption, and surface migration and rearrangement, which are not the key steps to determine the rate of photocatalytic reaction. Therefore, the effect of reaction temperature on photocatalytic degradation of organic pollutants is very small, but mainly may affect the dark reaction. This is consistent with the result of dark reaction.

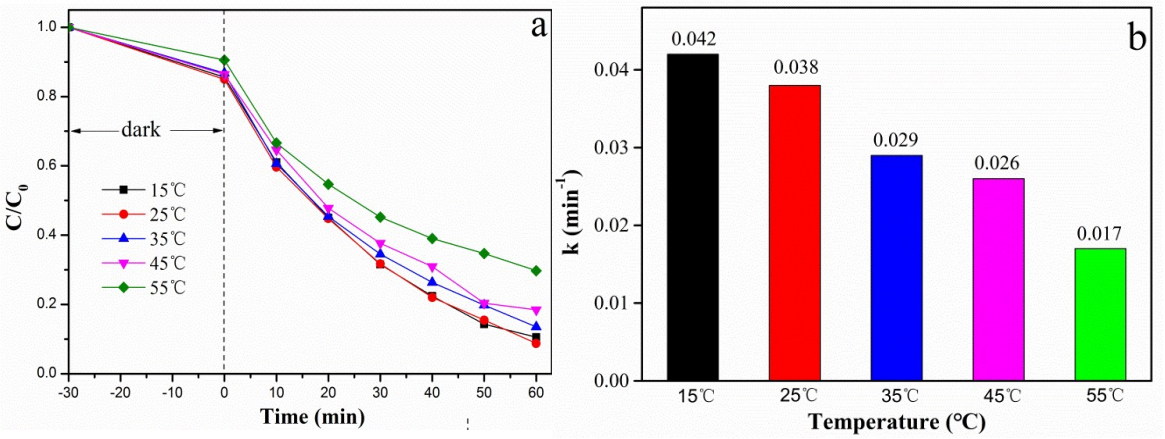

Fig.S4. (a) Photocatalytic degradation and (b) degradation rate of CN/CTAP-100 samples with different temperatures.

A Multi N/C 2100 Analyzer (Analytik Jena AG, Germany) was used to determine the TOC of 10 mg/L OR-II solution before and after photocatalysis. The results are shown in Fig.S5.

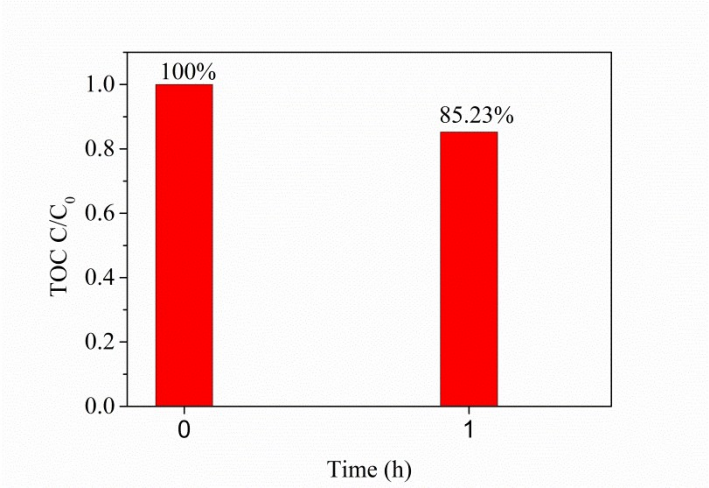

Fig.S5 TOC removal curves of OR-II before and after photocatalysis.