

## In-situ synthesis of layered TiO<sub>2</sub> NS/UiO-66/GO with improved adsorption and photocatalytic performance toward Congo red dye

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### ABSTRACT

In the work, the layered TiO<sub>2</sub> NS/UiO-66/GO composites were successfully prepared through an in-situ method. Two-dimensional TiO<sub>2</sub> NS combined with UiO-66/GO to form a layered structure. The prepared samples were characterized by X-ray diffraction, thermogravimetric analysis, Brunauer–Emmett–Teller test, scanning electron microscopy, energy dispersive X-ray spectroscopy, X-ray photoelectron spectroscopy, UV–Vis DRS and PL spectra. TiO<sub>2</sub> NS/40%UiO-66/GO exhibited the most efficient adsorption (20 and 1.3 times those of TiO<sub>2</sub> NS and UiO-66/GO, respectively) through absorbing Congo red (CR). It also displayed the strongest photocatalytic activity (29 and 2 times those of TiO<sub>2</sub> NS and UiO-66/GO, respectively) for degrading CR dye under visible-light irradiation ( $\lambda \geq 420$  nm). The removal rate of CR was nearly 100%. Besides, TiO<sub>2</sub> NS/40%UiO-66/GO showed excellent stability even after four cycling runs of adsorbing and photodegrading CR. The results showed that TiO<sub>2</sub> NS/UiO-66/GO composites were highly efficient adsorption and catalytic bifunctional materials. TiO<sub>2</sub> NS/UiO-66/GO composites provide an important basis for combining metal organic frameworks/GO with photocatalytic semiconductors to improve absorption and photocatalytic performance to better treat organic wastewaters.

*Keywords:* TiO<sub>2</sub> NS/UiO-66/GO; Layered structure; Adsorption; Photocatalysis; Congo red

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