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Photocatalytic degradation of methyl orange dye by Ti_3C_2–TiO_2 heterojunction under solar light

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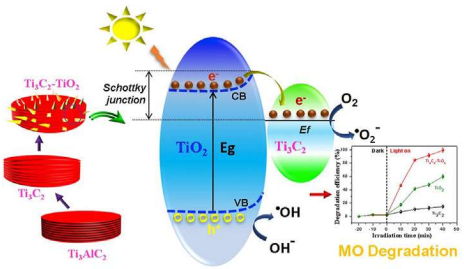
HIGHLIGHTS

- Ti_3C_2–TiO_2 heterostructure is synthesized from Ti_3C_2 by hydrothermal oxidation.
- *In-situ* transformation of TiO_2 leads to obtain Ti_3C_2–TiO_2 heterostructures.
- Ti_3C_2–TiO_2 photocatalyst exhibits a significant efficiency for MO degradation.
- The proposed MO photocatalytic mechanism toward Ti_3C_2–TiO_2 composite is illustrated.

GRAPHICAL ABSTRACT



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ABSTRACT

Photocatalytic activity is a feasible solution to tackle environmental pollution caused by industrial pollutants. In this research, Ti_3C_2–TiO_2 composite with a unique structure was fabricated successfully via a hydrothermal method. Especially, the *in-situ* transformation of TiO_2 from Ti_3C_2 MXene creates an intimate heterostructure, which leads to prolonging separation and migration of charged carriers. Thus, this Ti_3C_2–TiO_2 composite enhances effectively methyl orange (MO) degradation efficiency (around 99%) after 40 light-exposed minutes. Besides, the optimal concentration of MO solution was estimated at 40 mg/L and Ti_3C_2–TiO_2 photocatalyst also exhibited good stability after five runs. Moreover, the radical trapping test and the MO photodegradation mechanism over Ti_3C_2–TiO_2 system were also demonstrated.

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