Self-assembled nano leaf/vein bionic structure of TiO₂/MoS₂ composites for photoelectric sensors

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Fig. S1 SEM images of (a) TiO_2 nanobroccoli; and (b) MoS_2 nanohyacinth.

Fig. S1 shows the morphologies of the raw materials. TiO_2 nanoparticles are observed to form TiO_2 nanobroccoli, and MoS_2 nanosilks form MoS_2 nanohyacinth.



Fig. S2 (a) SEM image of TM20 surface; (b) SEM image of TM30 surface;(c) EDS of surface areas.

There are only TiO_2 nanoparticles observed on the surface of TM20, while MoS_2 nano silks can be found on the surface of TM30, as shown in **Fig. S2**.



Fig. S3 (a) SEM image of bulk-MoS₂; (b) TEM image of bulk-MoS₂; (c) TEM image of TiO_2 /bulk-MoS₂ composites; (d) Photocatalytic degradation activity of pure TiO_2 and TiO_2 /bulk-MoS₂ composites.

From Fig. S3, it can be seen that bulk-MoS₂ shows a massive layer structure, and cannot form a well-composited structure with TiO_2 . The TiO_2 /bulk-MoS₂ composites only show limitedly enhanced photocatalytic degradation activity than pure TiO_2 , which needs 30 min to photocatalytically degrade MB thoroughly.



Fig. S4 The ratio of the tested concentration and the original concentration of MB after each color switching cycle during the cyclic test of TM20/MB system.

From **Fig. S4**, after 20 cycles, the concentration of MB in TM20/MB is still maintained very close to the initial value.



Fig. S5 Repeat test of TM10.

From **Fig. S5**, after 10 cycles, the concentration of MB in TM10/MB system shows an obvious drop, and about 9.7% of MB has degraded since the beginning of the repeated tests.



Fig. S6 Linear relation between the concentration and absorbance of MB solution.

From **Fig. S6**, the concentration and absorbance of MB solution are observed to show a linear relation in the experimental range. Thus, we can detect the absorbance to determine the concentration of MB in the solutions.



Fig. S7 Linear relation between the absorbance change rate and optical power density.

From **Fig. S7**, we can see the absorbance change rate and optical power density shows a linear relation.



Fig. S8 The formation process of heterostructure in TiO_2/MoS_2 during composition. (A) before composition; (B) after composition, (a)(b) the change of conduction band edge and Fermi level, (c)(d) the formation of internal electric field.

Fig. S8 shows the formation process of heterostructure in TiO_2/MoS_2 during composition.



Fig. S9 The original data of the decoloration and recoloration process of the samples with respect to time.

Fig. S9 shows the original data of Fig. 3A.

	TM05	TM10	TM20	TM30
TiO ₂ (mg)	190	180	160	140
$MoS_2(mg)$	10	20	40	60

Table S1 The composition of TiO₂/MoS₂ composites.