Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Electronic Supporting Information

Rational design of 2D TiO_2-MoO_3 Step-scheme heterostructure for boosted photocatalytic overall water splitting

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Table S1. The reported details of TiO_2/MoO_3

Synthesis methods	**Morphology**	**Application**	**Mechanism**	Ref.
Electrochemical method	**Sheets-like**	**Water splitting**	**Step-scheme**	**This work**
Laser ablation	Spherical	Degradation (Methylene Blue)		1
impregnation method	NA	Degradation (Methylene Blue)		2
Ti-Mo alloy anodization	Nanotube layers	Water spiltting	NA	3
incipient wetness method	Film	Gas 2-propanol		4
In-situ growth mothod	Nanobelts	Degradation Rhodamine B	heterojunction	5
sol–gel method	NA	Degradation Rhodamine B		6
hydrothermal treatment	sphere-like	Degradation benzyl alcohol	heterojunction	7
Langmuir blodget technique	Film	Degradation Stearic acid		8
Hydrothermal methods	Nanofiber	Degradation Rhodamine B		9
a modified sol– gel method	Mesoporous nanocrystals	Degradation Methylene Blue		10
sol–gel method	Rod decorated by sphere like	Degradation Molasses	Z-scheme	11
Hydrothermal method	Nanowire array	Lithium battery	NA	12
Hydrothermal and calcination	Nanofiber	Degradation Rhodamine B	Heterojunction	13
Sol-gel method	NA	Degradation Rhodamine B	Heterojunction	14
Impregnation method	NA	H_2 production	Z-scheme	15
Hydrothermal	2D/1D	CO_2 reduction	Plasmonic effect	16

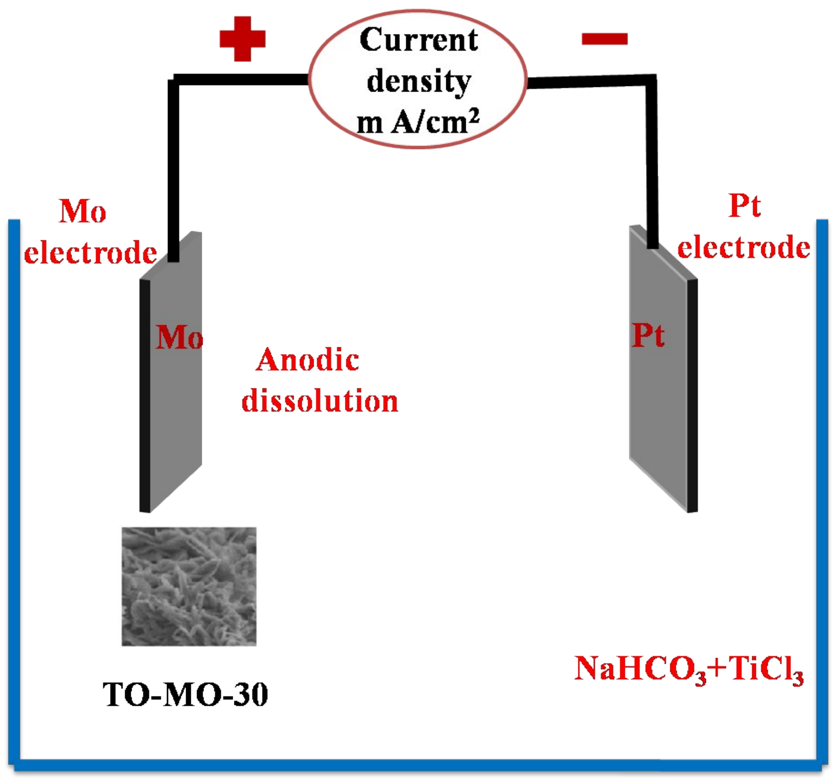

Fig.S1. Diagram representing the electrochemical synthesis process of TO-MO-30 heterostructure

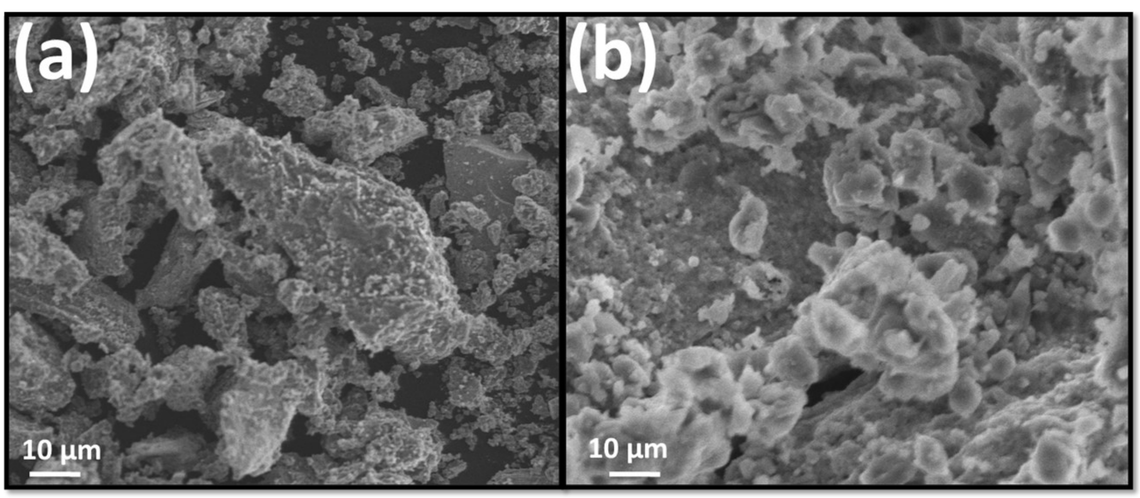

Fig.S2. SEM images of TO-MO-5 (a) and TO-MO-40 (b) heterostructure photocatalysts

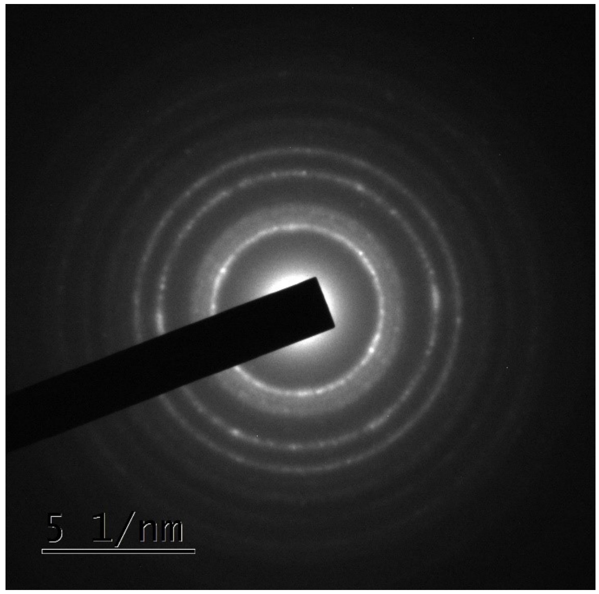

Fig.S3. Selected area electron diffraction SAED image of TO-MO-30

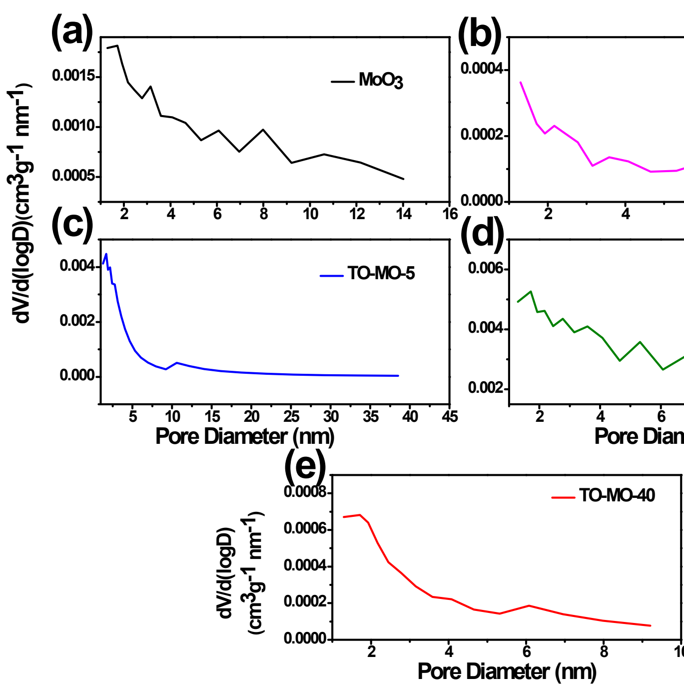

Fig.S4 BJH Pore size distribution of pristine (a) MoO_3, (b) TiO_2 photocatalyst, and (c) TO-MO-5, (d) TO-MO-30, and (e) TO-MO-40 heterostructure photocatalysts

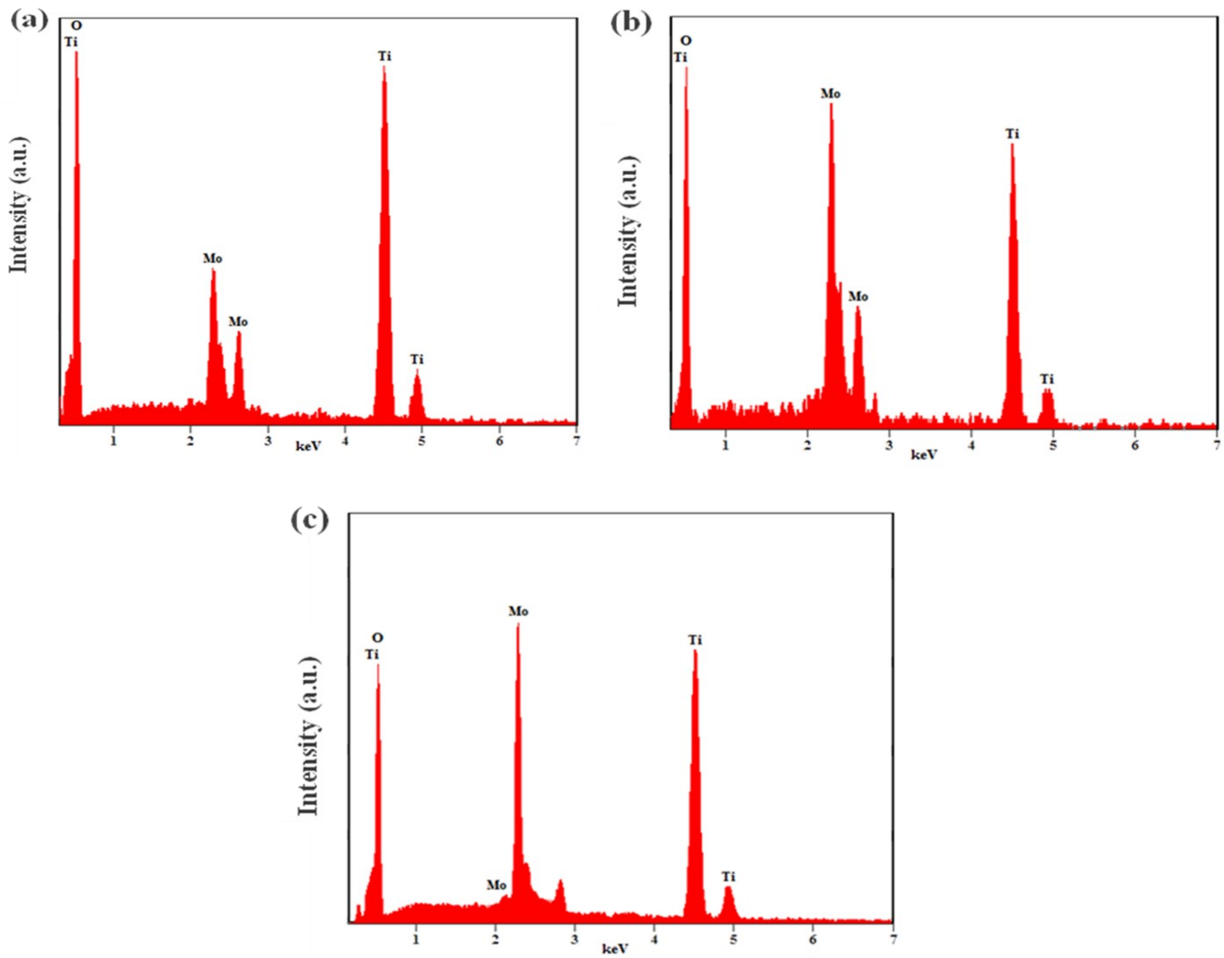

Fig.S5. EDX spectra of (a) TO-MO-5, (b) TO-MO-30, and (c) TO-MO-40 heterostructure photocatalyst

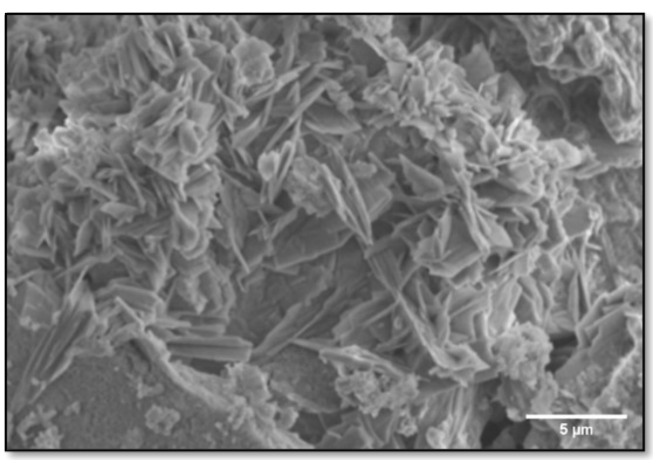

Fig.S6. SEM image of TO-MO-30 heterostructure photocatalyst after five cycles

Table S2. Photocatalytic water splitting comparison with existing MoO_3 based materials

	Catalyst	Evolved H_2	Evolved O_2	AQE (H_2)	Light source	Reff.
1	MoO_3/Polyamide	~1000 μmol/h/g	----	2.3% at 420 nm	Solar light	17
2	Pt/MoO_3/TiO_2	169 μmol/h/g	-----	-----	UV light	18
3	2D/2D MoO_3-x/g-C_3N_4	85 μmol/h/g	-----	7.8 % at λ > 420 nm	Visible light	19
4	MoO_3/g-C_3N_4	512.5 μmol/ h/ g	-----	-----	Visible light	20
5	amine-CdS/MoO_3	1029.8 μmol/h/g	-----	-----	Visible light	21
6	Cu_2S-MoO_3	21.568 μmol/h/g	------	------	400W Xenon lamp (UV-Vis)	22
7	MoO_3/ZnO	2.5 ml (Volume)	-----	------	Visible light	23
8	CdS QD/ MoO_3–OV/g–C_3N_4	294.32 μmol/h/g and 1408.57 μmol/h/g	-----	16.35% at 420 nm	Visible light and Solar light	24
9	MoO_3/g-C_3N_4	20.52 μmol/h/g	-----	-----	Visible light	25
10	HxMoO_3@$ZnIn_2S_4$ (HZ)	110 μmol/h/g	------	32.95 % at 420 nm	Visible light	26
11	TiO_2-MoO_3	151 μmol/h/g	76 μmol/h/g	1.38% at 420 nm	Simulated solar light	**This work**

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