Supporting Information

Bioinspired Floatable System with 3D Sandwich-type Triphase Interface for Highly Efficient Nitrogen Fixation

Xiuyan Wang[a], Xinjian Shi[a], Shengyan Yin[b], Ping She[c,d], Jiaqi Zheng[a], Yudong Song[a], Hang Sun[a,*]

[a]Key Laboratory of Bionic Engineering (Ministry of Education), College of Biological and Agricultural Engineering, Jilin University, Changchun, Jilin 130022, China

[b]State Key Laboratory of Integrated Optoelectronics, College of Electronic Science and Engineering, Jilin University, Changchun, Jilin 130012, P. R. China

[c]State Key Laboratory of Inorganic Synthesis and Preparative Chemistry, College of Chemistry, International Center of Future Science, Jilin University, 2699 Qianjin Street, Changchun 130012, P. R. China

[d]Key Laboratory of Surface and Interface Chemistry of Jilin Province, College of Chemistry, Jilin University, 2699 Qianjin Street, Changchun 130012, P. R. China

*Corresponding author email: sunhang@jlu.edu.cn

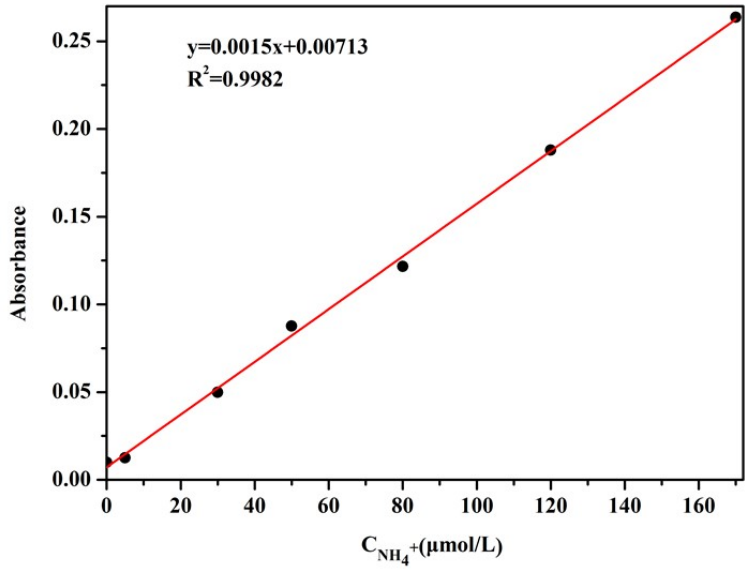

Fig. S1 Standard curve of ammonia measured by colorimetric with Nessler's reagent.

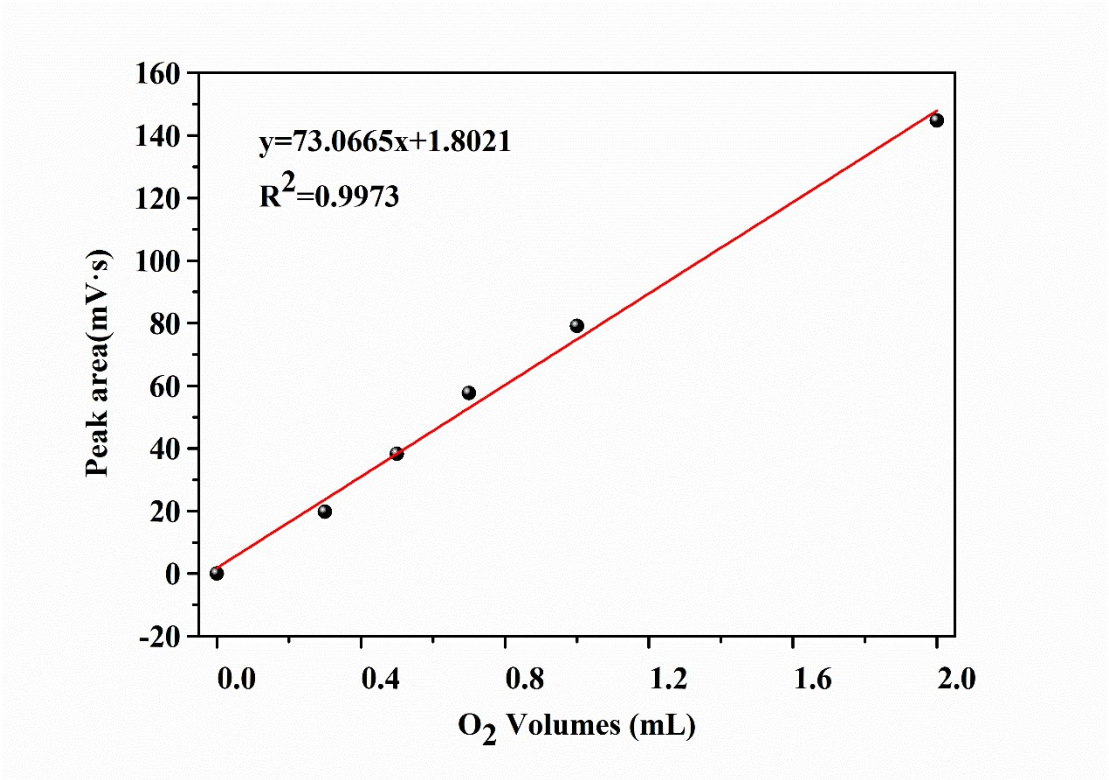

Fig. S2 Standard curve of oxygen measured by gas chromatography analysis.

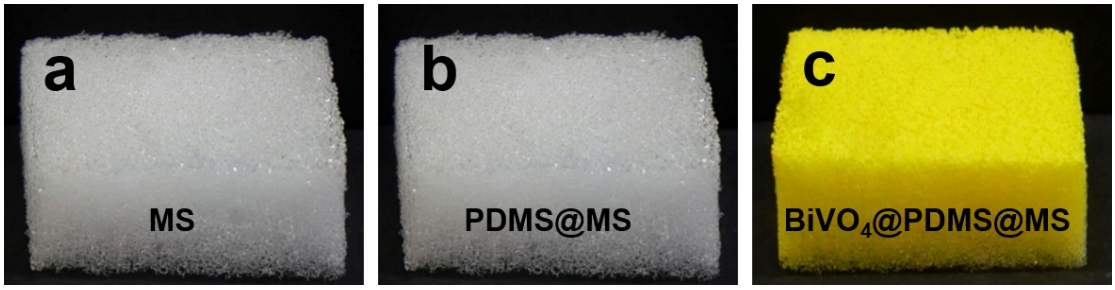

Fig. S3 The digital picture of (a) MS, (b) PDMS@MS, (c) $BiVO_4$@PDMS@MS.

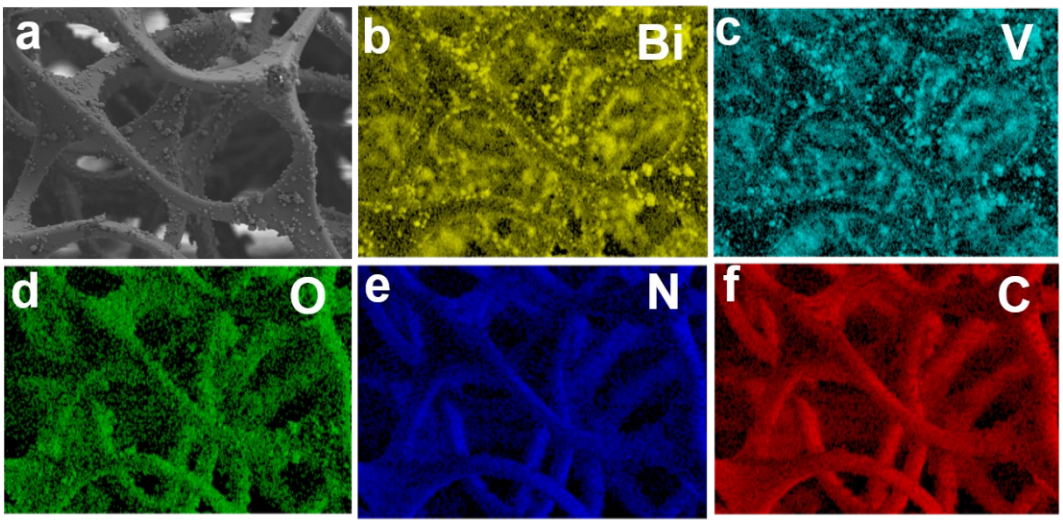

Fig. S4 (a) SEM image of $BiVO_4$@ MS-l and corresponding EDX elemental mapping profiles of (i) Bi (yellow), (j) V (blue-green), (l) O (green), (m) N (blue), and (n) C (red).

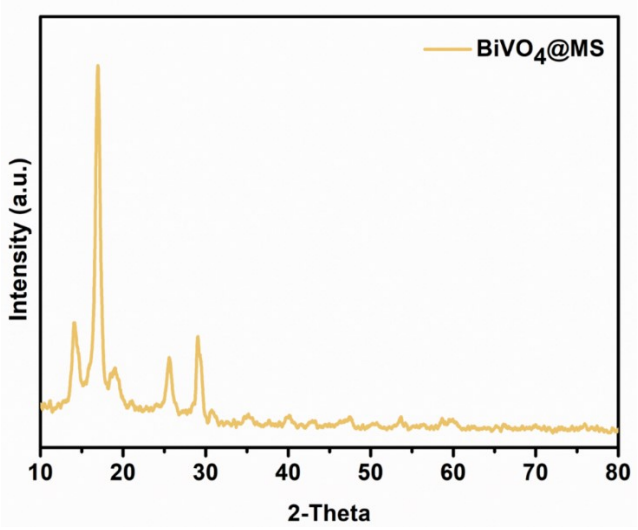

Fig. S5 XRD pattern of $BiVO_4$@ MS.

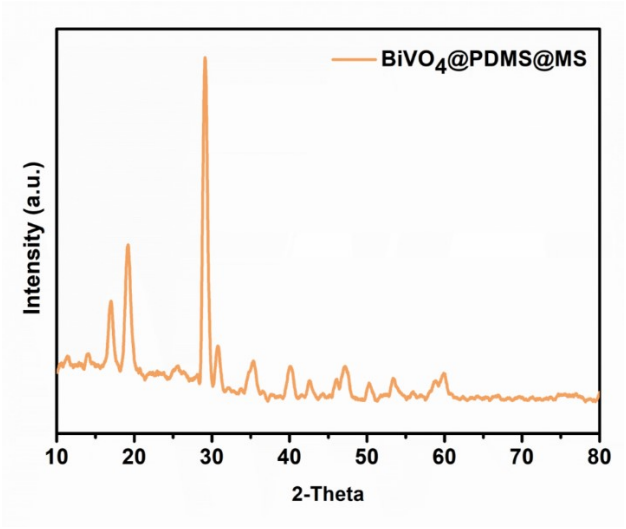

Fig. S6 XRD pattern of $BiVO_4$@PDMS@MS after 3 cycles of reaction.

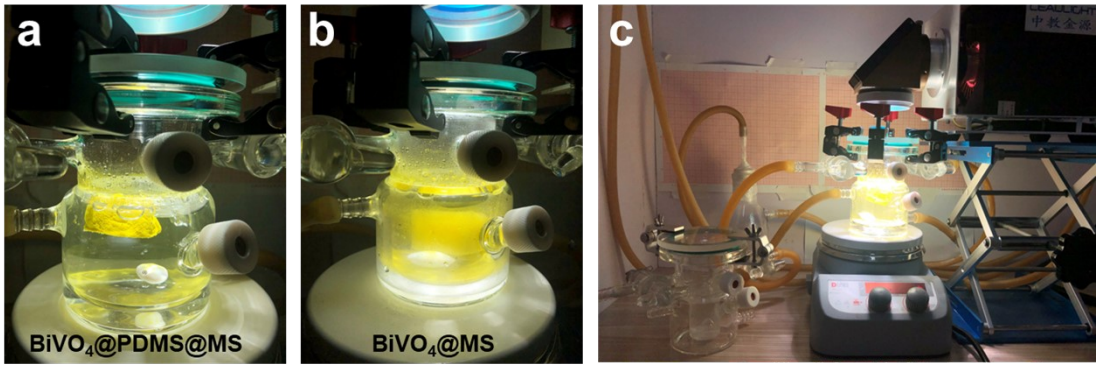

Fig. S7 The digital picture of reaction system $BiVO_4$@MS (a) and $BiVO_4$@PDMS@MS (b) and overall reaction equipment (c).

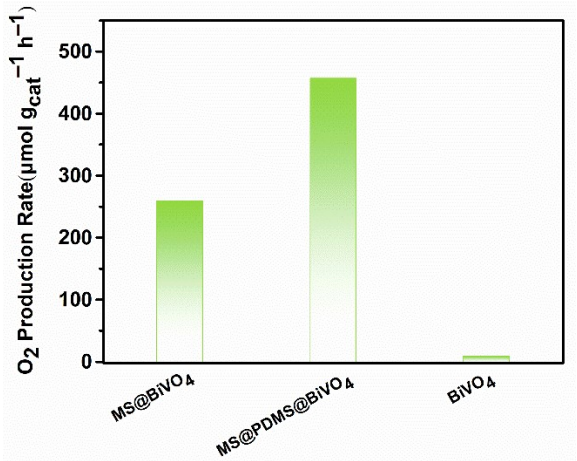

Fig. S8 (a)Comparison of photocatalytic O_2 generation activity of as prepared $BiVO_4$@PDMS@MS catalysts and control experiments.

Table S1. Summary of previously-reported catalysts $BiVO_4$ for photo/electrocatalytic nitrogen fixation in aqueous solution under mild conditions

Catalyst	Scavenger	Light Source power(wavelength)	NH_3 Yield ($\mu mol\ g_{cat}^{-1}\ h^{-1}$)	Testing method	Ref.
BP-$BiVO_4$	30 mL ethanol and 70 mLwater	350 W Xe arc lamp visible light	208	Nessler's reagent	[1]
$BiVO_4$/$ZnIn_2S_4$	No	300 W Xe arc lamp ($\lambda > 400$ nm)	80.6	Nessler's reagent and ion chromatography	[2]
$BiVO_4$	No	300 W Xe arc lamp ($\lambda > 400$ nm)	103.4	Nessler's reagent	[3]
p-$BiVO_4$	No	300 W Xe arc lamp ($\lambda > 400$ nm) PEC NRR	11.6×10^{-8} mol h^{-1} cm^{-2}	Nessler's reagent	[4]
$BiVO_4$/$MnCO_3$/C	No	($\lambda > 400$ nm) PEC NRR	2.426 mmol m^{-2} h^{-1}	Nessler's reagent	[5]
Ag-OVs-BVO	5% methanol	300 W Xe arc lamp ($\lambda > 400$ nm)	50.7	indophenol blue	[6]
$BiVO_4$-0.50	No	300 W Xe arc lamp ($\lambda > 400$ nm)	15.5 mmol g^{-1} L^{-1} h^{-1}	Nessler's reagent	[7]
Au/$BiVO_4$	H_2O:CH_3OH=4:1	300 W Xe arc lamp ($\lambda > 400$ nm)	0.419 mg·L^{-1}	Nessler's reagent	[8]

$BiVO_4$ (pH=7)	Na_2SO_4	PEC NRR	8.60 μg h^{-1} $mg^{-1}_{cat.}$	indophenol blue	[9]
$BiVO_4$@ PDMS@ MS	No	300 W Xe arc lamp (λ > 400 nm)	624.87	Nessler's reagent	This work

Table S2. Photocatalytic N_2 fixation over the catalyst under various reaction conditions.[a]

Entry	Catalyst	Light (> 400 nm)	Atmosphere	Solvent	NH_3 production rate (μmol g_{cat}^{-1} h^{-1})
1	$BiVO_4$@PDMS@MS	√	N_2	H_2O	624.87
2	$BiVO_4$@MS	√	N_2	H_2O	373.25
3	$BiVO_4$	√	N_2	H_2O	1.77
4	$BiVO_4$@PDMS@MS	√	Ar	H_2O	N.D.[b]
5	PDMS@MS	√	N_2	H_2O	N.D.[b]
6	×	√	N_2	H_2O	N.D.[b]
7	$BiVO_4$@PDMS@MS	×	N_2	H_2O	N.D.[b]
8	$BiVO_4$@PDMS@$MS_{1/3}$	√	N_2	H_2O	524.56

[a] Reaction condition: light intensity (200 mW cm^{-2}), H_2O (100 mL), reaction time (4 h). [b] N.D. = not detected.

Reference

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