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Supporting Information

The insight of regulation between crystallinity and oxygen vacancy of $BiVO_4$ affects the photocatalytic oxygen evolution activity

Yaqian Zhang[a], Wenjun Han[a], Lingling Ding[a], Fan Fang[a], Zhengzheng Xie[a], Xianglei Liu[b], Kun Chang*[a]

[a] Y. Zhang, W. Han, L. Ding, Dr. F. Fang, Dr. Z. Xie, Prof. K. Chang

a. Centre for Hydrogenergy, College of Materials Science and Technology, Nanjing University of Aeronautics and Astronautics, Nanjing 210016, P. R. China. E-mail: changkun@nuaa.edu.cn

[b] Xianglei Liu

b. College of Energy and Power Engineering, Nanjing University of Aeronautics and Astronautics, Nanjing 210016, P. R. China

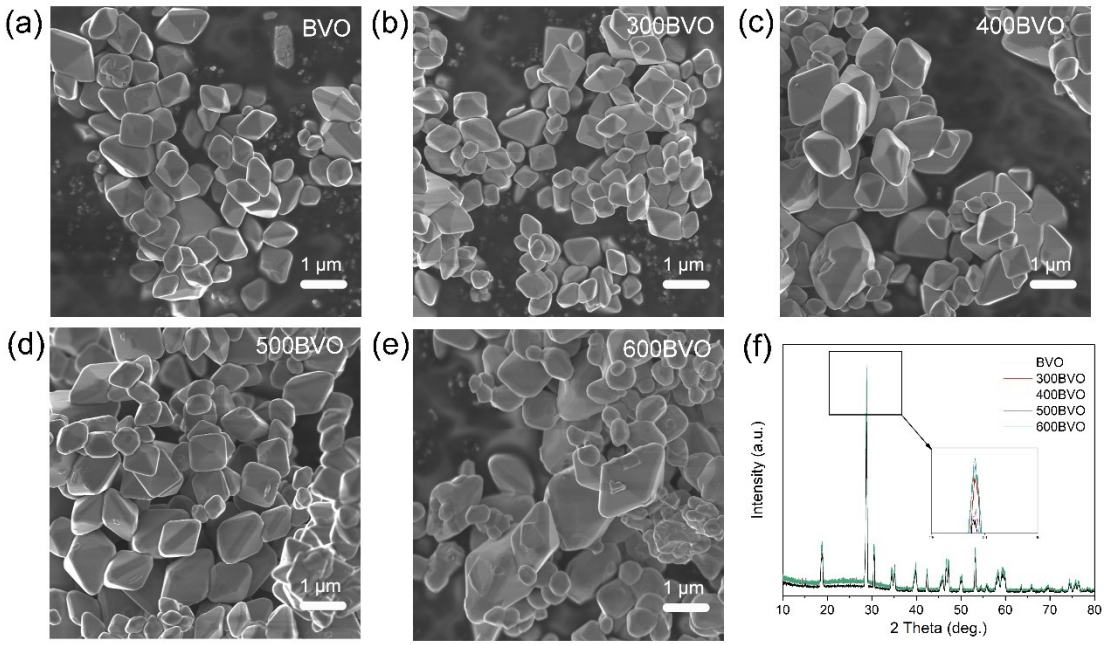

Fig.S1 (a-d) SEM and (f) XRD of $BiVO_4$ before and after heat treatment at 300, 400, 500, and 600 °C.

Table S1. FWHM and Crystallinity of $BiVO_4$ before and after heat treatment at 300, 400, 500, and 600 °

		BVO	300BVO	400BVO	500BVO	600BVO
FWHW	（112）	0.33819	0.3297	0.31507	0.33279	0.33804
	（011）	0.54841	0.41661	0.38024	0.51415	0.56290
Crystallinity		70.47%	70.64%	98.42%	71.85%	68.63%

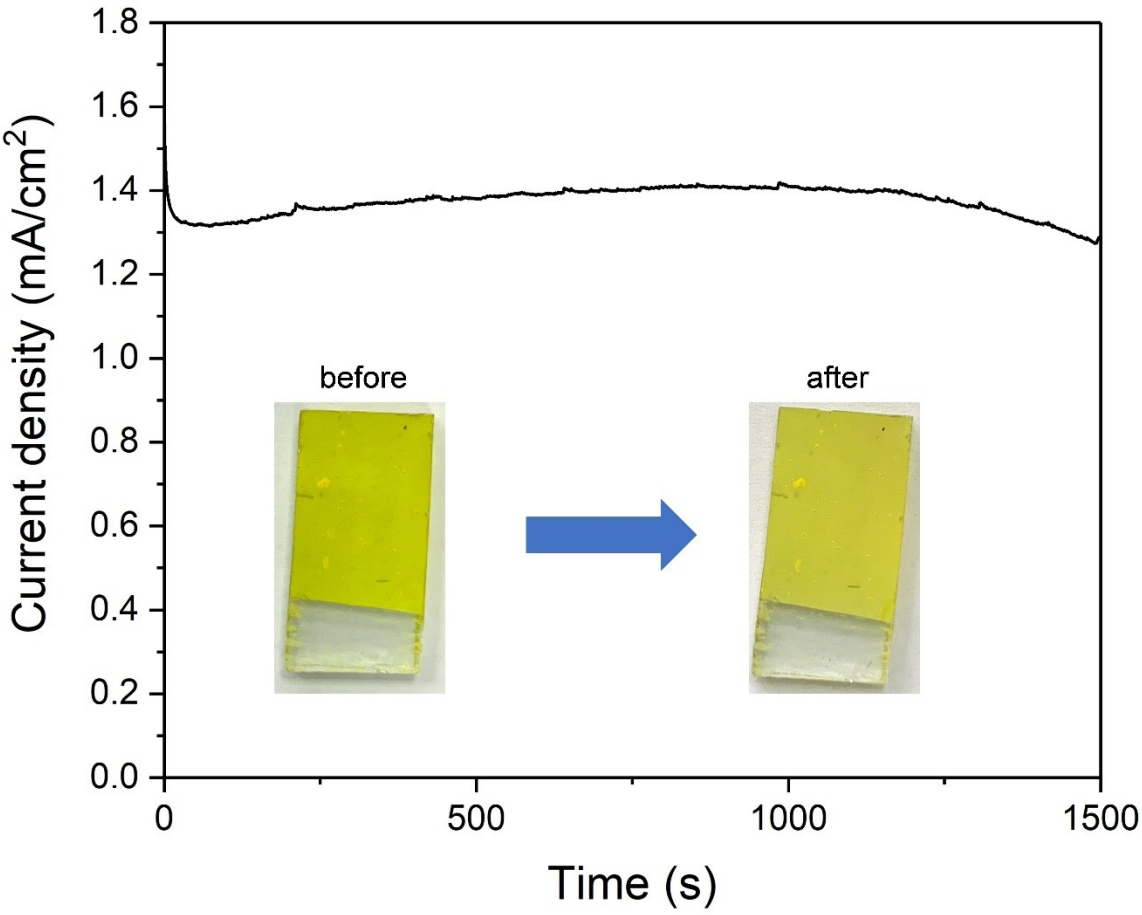

Fig.S2 i-t test of 400BVO film.

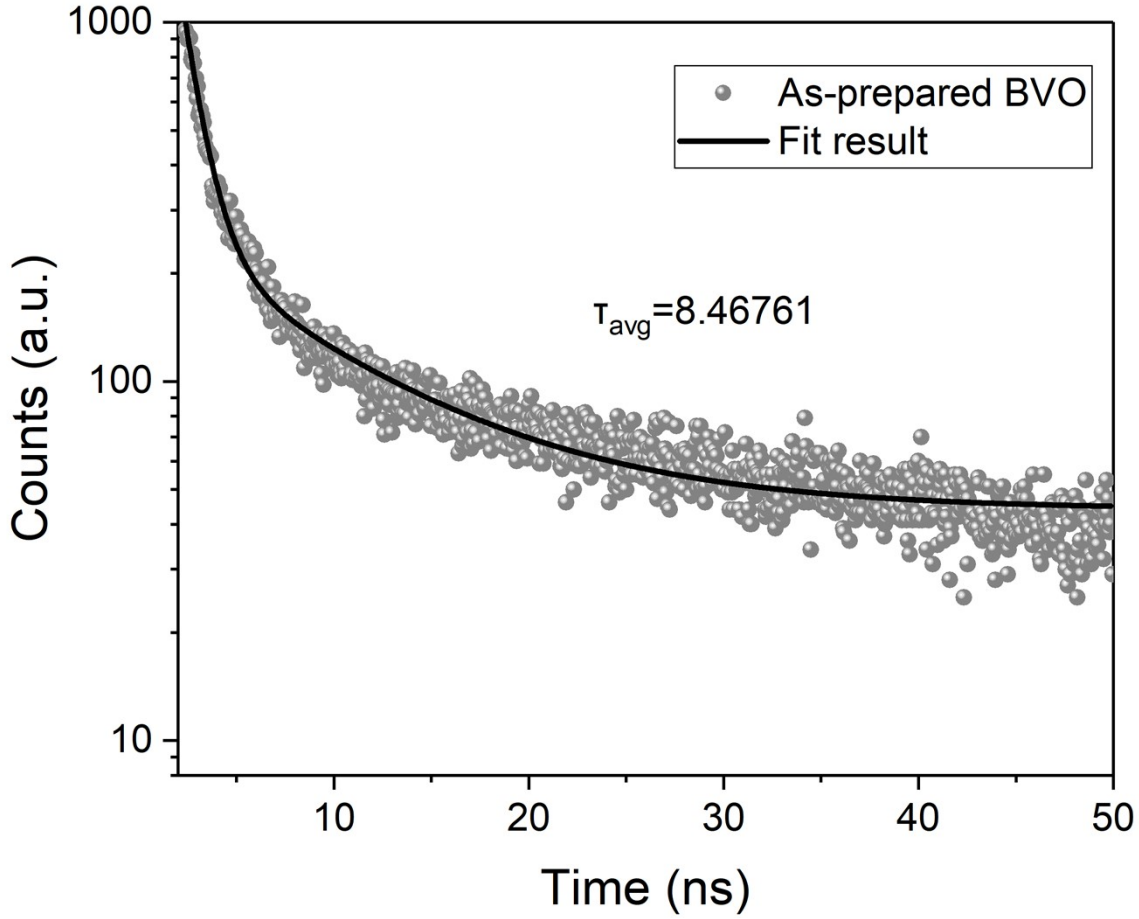

Fig.S3 The fluorescence lifetime of $BiVO_4$ before heat treatment at 300, 500, and 600 °C.

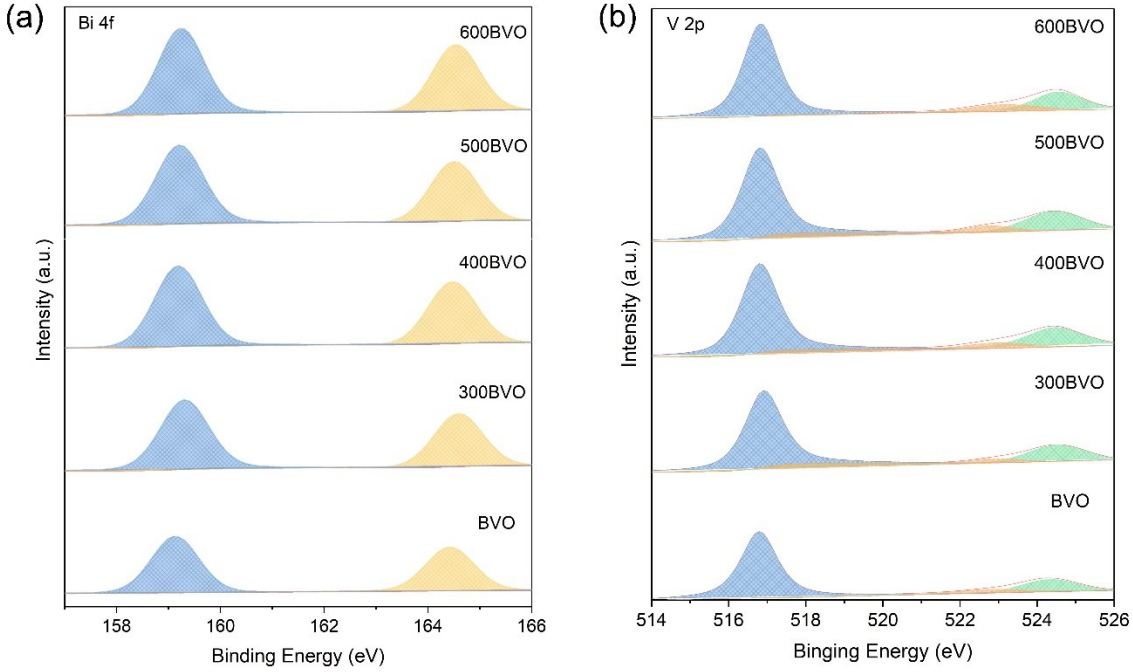

Fig. S4 The XPS spectra of $BiVO_4$ before and after O_2 heat treatment at 300, 400,500, and 600 °C: (a) Bi 4f, (b) V 2p.

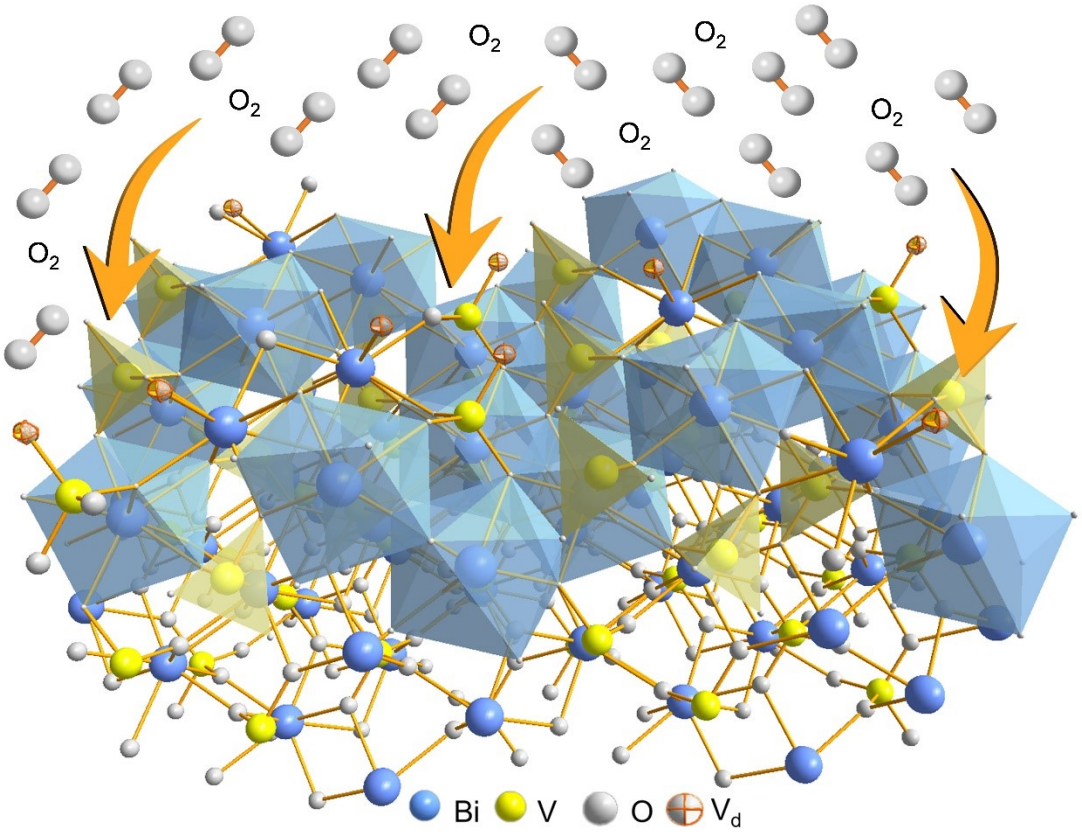

Fig. S5 Schematic illustration of the oxygen defect recombination process.

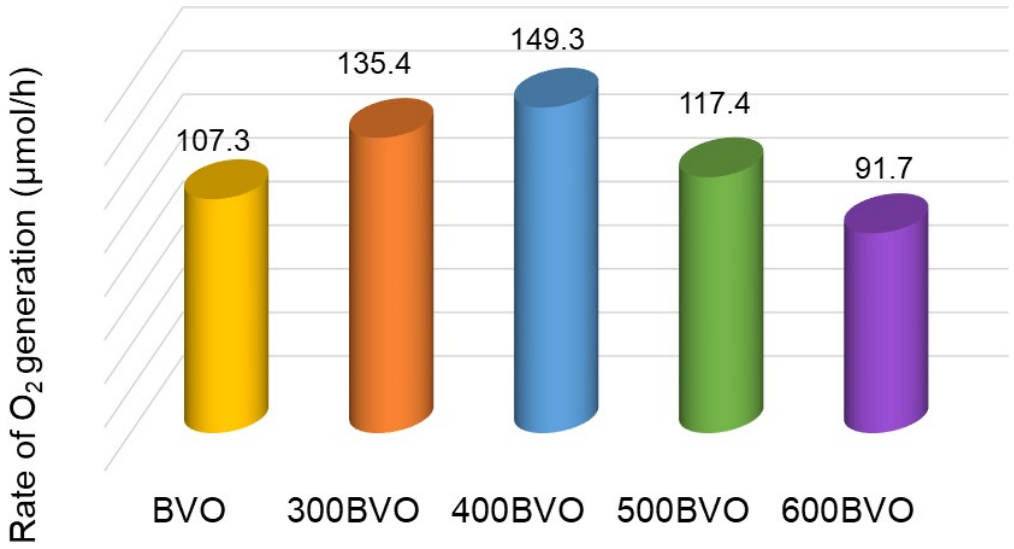

Fig. S6 Photocatalytic rate of O_2 generation in $Fe_2(SO_4)_3$.

Fig.S7 The chromogenic reaction of NO_2^- and Fe^{2+}.

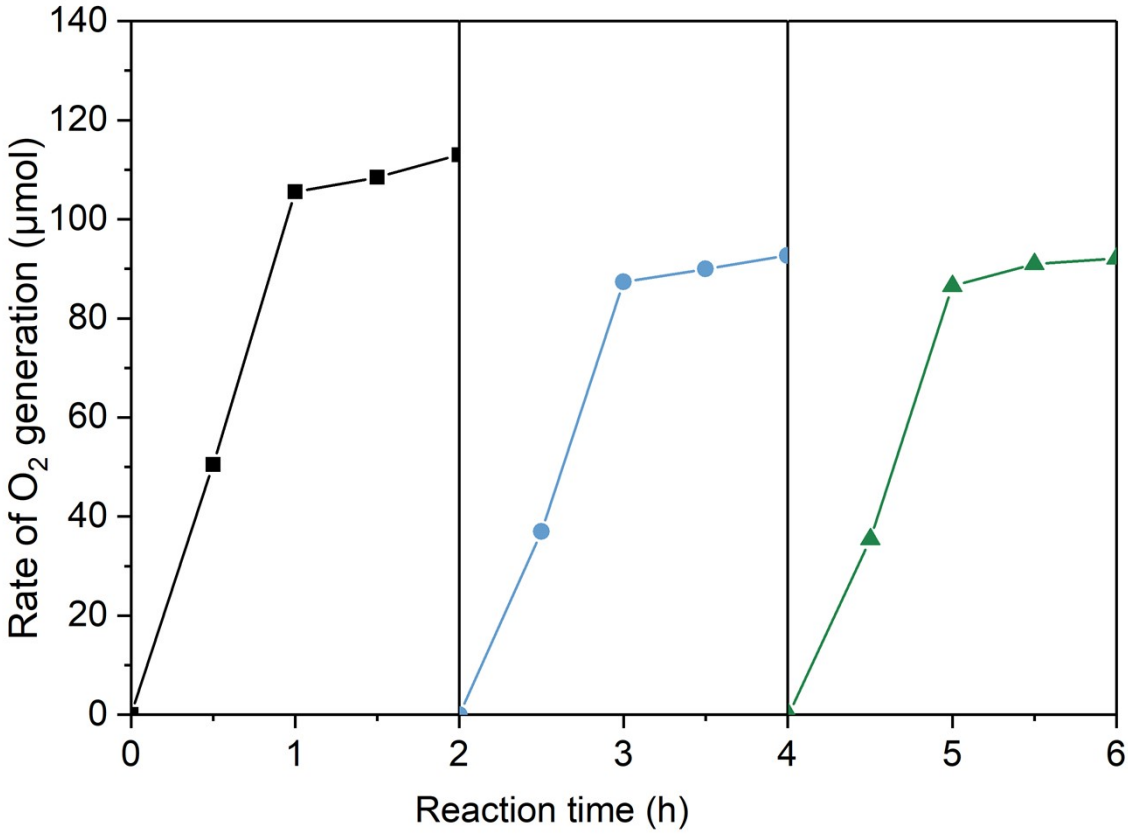

Fig. S8 The recyclability experiments in $Fe_2(SO_4)_3$ solution.

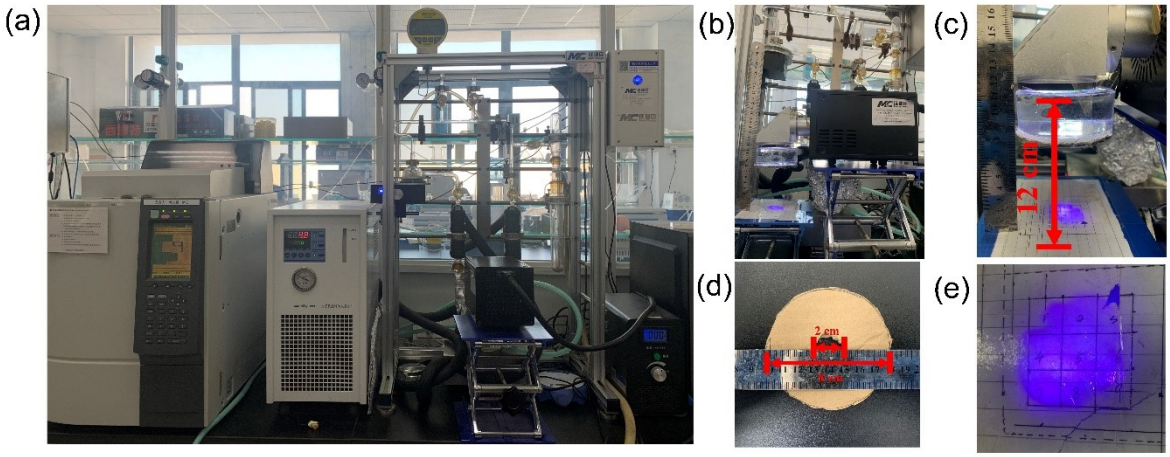

Fig.S9 The testing of water splitting research and AQY test: (a) An automatic injection circulation system. (b) and (c) The distance between the light intensity detector and the emission center of the lamp source is 12 cm. (d) 420 nm monochromatic filter with a diameter 2 cm. (e) light spot with a diameter 3 cm.

Table S2. The AQY test data of 400BVO.

λ (nm)	Rate of O_2 (μmol/cm^2)	I (mW/cm^2)	AQY (%)
365	0.154	2.8	38.29
420	0.1268	2.65	28.87
450	0.1067	2.2	27.36
500	0.0821	2.24	18.65
550	0.0295	2.18	6.25

Calculating AQY according to the following equations:

$$\mathrm{AQY}(\%) = \frac{\text{Number of reacted electrons}}{\text{Number of incident photons}} \times 100\%$$

$$= \frac{\text{Number of evolved } O_2 \text{ molecules} \times 4}{\text{Number of incident photons}} \times 100\%$$

$$= \frac{\mu\text{mol} \times N_A \times 10^{-6} \times 4}{\frac{I \times A \times t}{E_g \times J}} \times 100\%$$

In which $N_A = 6.02*10^{23}$, Eg = 1240/λ, (λ=420nm), A (area) = 3.14 cm^2, t (time) = 60 s, J = $1.6*10^{-19}$ j.

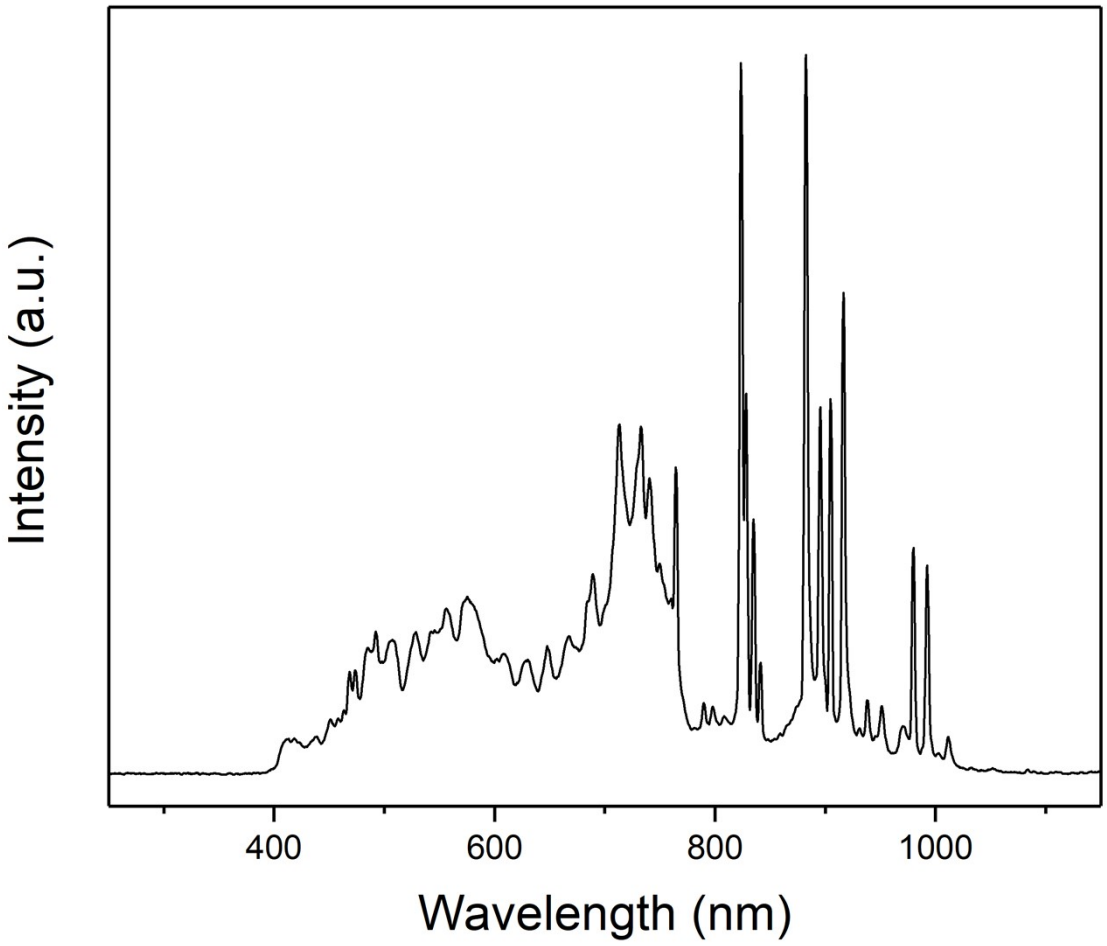

Fig.S10 The spectrum of the 300 W Xenon lamp equipped with CUT 420 nm monochromatic filter.