

LaVO<sub>4</sub> with alkali metal doping for enhanced photocatalytic water splitting

Linjie Yan<sup>1</sup>, Fan Zhang<sup>3</sup>, Fan Liu<sup>2</sup>, Xiaoyi Lei<sup>1</sup>, Xuecheng Liu<sup>1\*</sup>, Xia Jin<sup>1</sup>, Xiaole Zhu<sup>1</sup>, Tingting Pei<sup>1</sup>, Hongyu Chen<sup>1</sup>

<sup>1</sup>Chongqing Key Laboratory of Catalysis and New Environmental Materials, College of Environment and Resources, Chongqing Technology and Business University, Chongqing 400067, China

<sup>2</sup>Chongqing Academy of Metrology and Quality Inspection, Chongqing, China

\*Correspondence:

<sup>3</sup>Sichuan Highway Planning, Survey, Design and Research Institute Ltd

Xuecheng Liu (E-mail: [liuxc@ctbu.edu.cn](mailto:liuxc@ctbu.edu.cn))

### Supplementary Figures and Tables

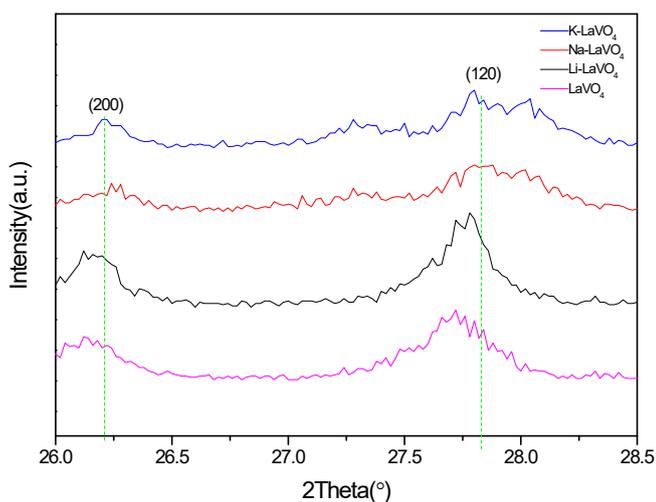


Fig. S1. XRD patterns of LaVO<sub>4</sub>, Li-LaVO<sub>4</sub>, Na-LaVO<sub>4</sub> and K-LaVO<sub>4</sub>.

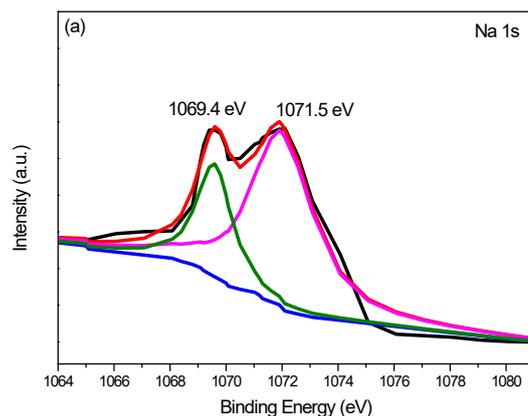


Fig. S2. XPS spectra of Na 1s of Na-LaVO<sub>4</sub>.

Table S1. Comparison of photocatalytic effects of vanadate.

Photocatalysts	Co-catalysts	Light	H <sub>2</sub> activity	Reference
Na-LaVO <sub>4</sub>	0.75wt%Pt	$\lambda \geq 420$ nm, 300W	2.83 $\mu\text{mol/h/g}$	In this work
LaVO <sub>4</sub>	0.5 M Na <sub>2</sub> S	$\lambda \geq 420$ nm, 300W	8 $\mu\text{mol/h}^2$	[1]
CaTaO <sub>2</sub> N	RhCrOy	$\lambda \geq 420$ nm, 300W	0.15 $\mu\text{mol/h}^3$	[2]
SrTaO <sub>2</sub> N	1wt% Pt	$\lambda \geq 420$ nm, 300W	0.9 $\mu\text{mol/h}^4$	[3]
C <sub>3</sub> N <sub>4</sub>	0.75wt% Pt	$\lambda \geq 420$ nm, 300W	3.13 $\mu\text{mol/h/g}^5$	[4]
NCDs/DCN	-----	$\lambda \geq 420$ nm, 300W	3.7 $\mu\text{mol/h/g}$	[5]
NiO/g-C <sub>3</sub> N <sub>4</sub>	-----	$\lambda \geq 420$ nm, 300W	30 $\mu\text{mol/h/g}$	[6]

## References

- Veldurthi, N. K.; Eswar, N. K.; Singh, S. A.; Madras, G., Cocatalyst free Z-schematic enhanced H<sub>2</sub> evolution over LaVO<sub>4</sub>/BiVO<sub>4</sub> composite photocatalyst using Ag as an electron mediator. *Applied Catalysis B: Environmental* 2018, 220, 512-523.
- Xu, J.; Pan, C.; Takata, T.; Domen, K., Photocatalytic overall water splitting on the perovskite-type transition metal oxynitride CaTaO<sub>2</sub>N under visible light irradiation. *Chemical Communications* 2015, 51, (33), 7191-7194.
- Wang, Y.; Wei, S.; Xu, X., SrTaO<sub>2</sub>N-CaTaO<sub>2</sub>N solid solutions as efficient visible light active photocatalysts for water oxidation and reduction. *Applied Catalysis B: Environmental* 2020,

263, 118315.

4. Liu, X.; Yan, L.; Hu, X.; Feng, H.; Guo, B.; Ha, X.; Xu, H., Facile synthesis of B and P doped g-C<sub>3</sub>N<sub>4</sub> for enhanced synergetic activity between photocatalytic water splitting and BPA degradation. *International Journal of Hydrogen Energy* 2023, 48, (35), 13181-13188.
5. H. Liu, J. Liang, S. Fu, L. Li, J. Cui, P. Gao, F. Zhao, J. Zhou, , N doped carbon quantum dots modified defect-rich g-C<sub>3</sub>N<sub>4</sub> for enhanced photocatalytic combined pollutions degradation and hydrogen evolution. *Colloids Surf. A Physicochem. Eng. Asp.* 591(2020), 124552.
6. Y. Fu, C.A. Liu, C. Zhu, H. Wang, Y. Dou, W. Shi, M. Shao, H. Huang, Y. Liu, Z. Kang, High-performance NiO/g-C<sub>3</sub>N<sub>4</sub> composites for visible-light-driven photocatalytic overall water splitting. *Inorg. Chem. Front.* 5(2018), 1646-1652.