

Control of the Photocatalytic Activity of Metastable Layered Oxynitride $K_2LaTa_2O_6N$ through Topochemical Transformation of Tuned Oxide Precursors

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Supporting Information (SI)

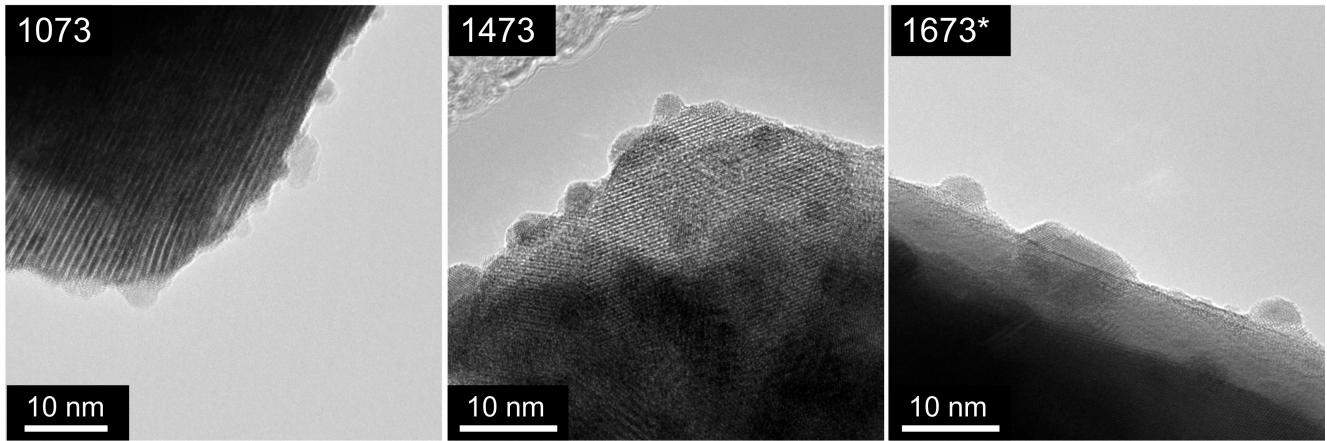


Figure S1. HR-TEM images of the $\text{H}^+/\text{Ir}/\text{K}_2\text{LaTa}_2\text{O}_6\text{N}-T$.

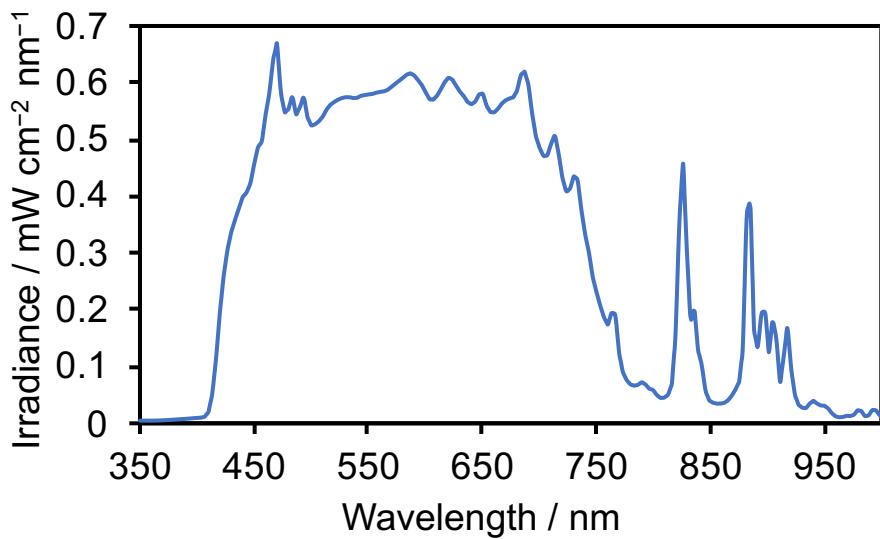


Figure S2. Spectral irradiance of the light source used in this work: 300 W Xe lamp fitted with a CM-1 cold mirror and a L42 cutoff filter. The light intensity was 0.20 W cm^{-2} at the wavelength range of 400–700 nm.

Supporting Information (SI)

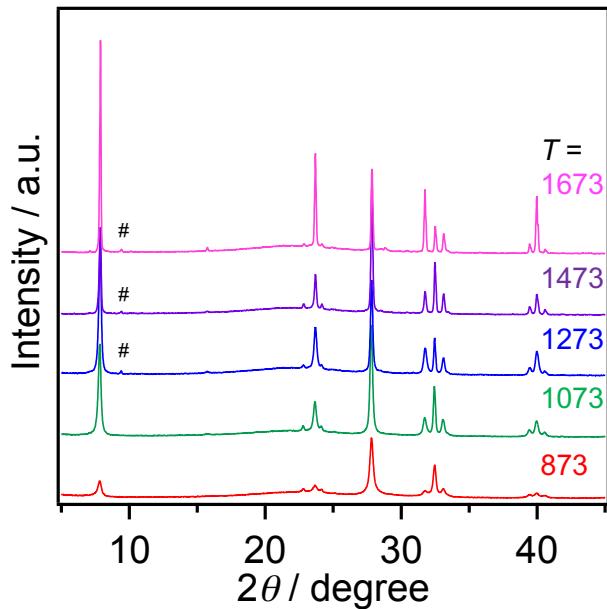


Figure S3. XRD patterns for $\text{CsLaTa}_2\text{O}_7-T$. The # marks indicate unknown impurities. The reference data for $\text{CsLaTa}_2\text{O}_7$ is not shown, because it is not available. Nevertheless, the XRD patterns of the obtained products are identical to those reported previously (Ref. 35).

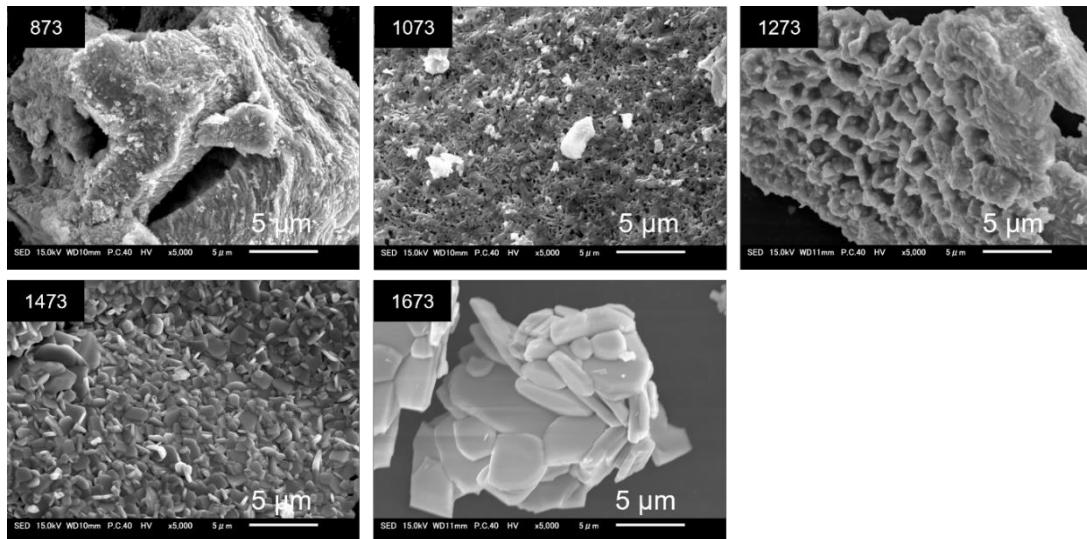


Figure S4. SEM images of $\text{CsLaTa}_2\text{O}_7-T$.

Supporting Information (SI)

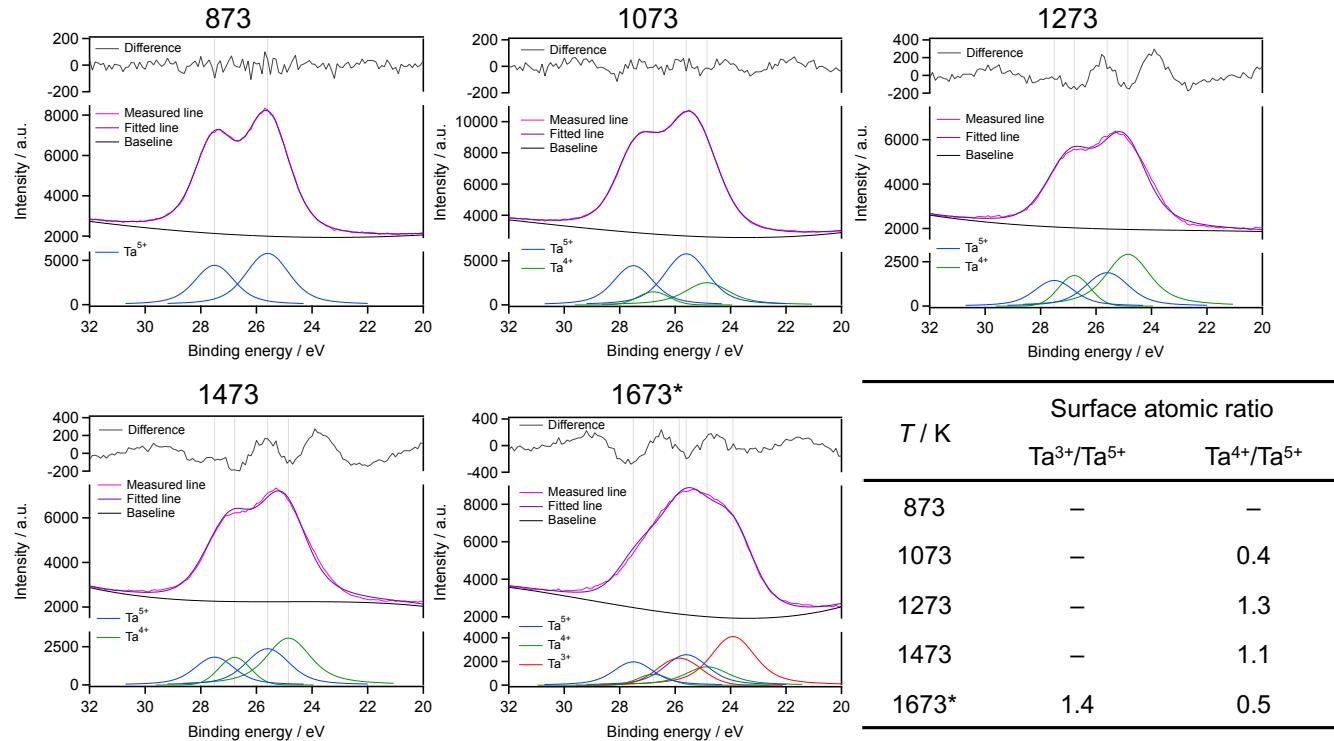


Figure S5. Result of XPS curve fitting analysis. The original data is shown in Figure 5. The peak positions of the Ta species having different oxidation states, as determined in this work, are close to those reported previously (*Phys. Chem. Chem. Phys.* **2014**, *16*, 5755–5762).

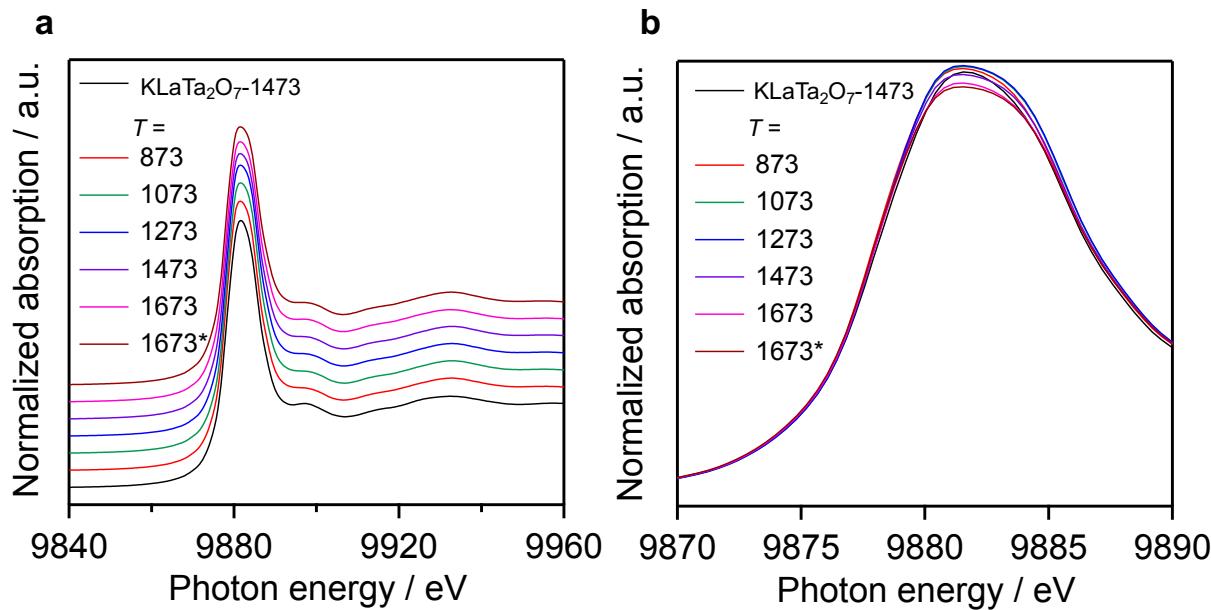


Figure S6. (a) Ta L₃-edge XANES spectra and (b) their magnification around the white line in K₂LaTa₂O₆N-*T* and KLaTa₂O₇-1473.

Supporting Information (SI)

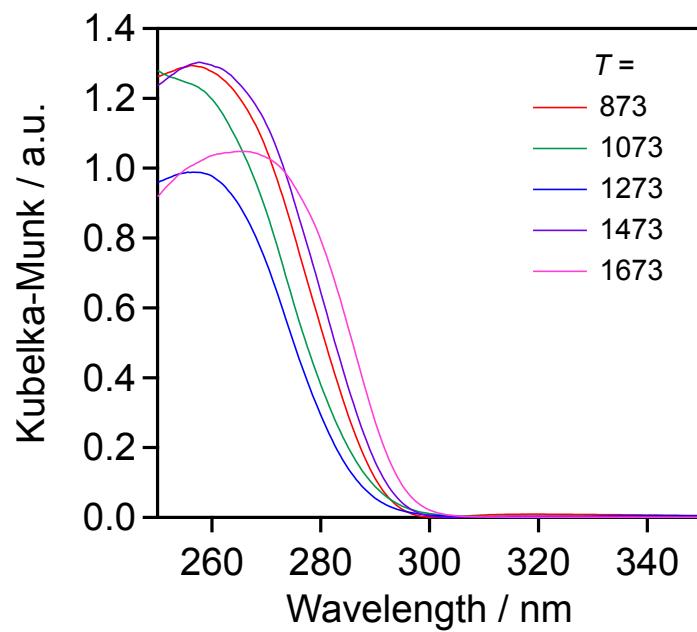


Figure S7. UV-visible DRS spectra of KLaTa₂O₇-T.

Supporting Information (SI)

Table S1. Elemental compositions for KLaTa₂O₇-*T* determined by EDS.

KLaTa ₂ O ₇ - <i>T</i>	Atomic ratio		
	K/Ta	Cs/Ta	La/Ta
873	0.46±0.04	0.05±0.02	0.55±0.08
1073	0.55±0.04	0.02±0.01	0.58±0.04
1273	0.53±0.03	0.02±0.01	0.52±0.05
1473	0.52±0.01	0.02±0.01	0.56±0.06
1673	0.27±0.11	0.29±0.12	0.54±0.04
Ideal	0.5	0	0.5

Table S2. Surface atomic ratios for K₂LaTa₂O₆N-*T* determined by XPS.

K ₂ LaTa ₂ O ₆ N- <i>T</i>	Atomic ratio			
	K/Ta	Cs/Ta	La/Ta	N/Ta
873	1.67	0.02	0.39	0.10
1073	1.28	0.01	0.46	0.26
1273	1.58	0.01	0.44	0.58
1473	1.33	0.02	0.48	0.28
1673	1.15	0.21	0.46	0.58
1673*	1.21	N.D.	0.54	0.75
Ideal	1	0	0.5	0.5

Table S3. Initial rates of H₂ evolution over H⁺/Ir/K₂LaTa₂O₆N-*T*.^a

H ⁺ /Ir/K ₂ LaTa ₂ O ₆ N- <i>T</i>	H ₂ evolution rate / μmol h ⁻¹
873	8.4
1073	9.4
1273	12.7
1473	13.0±1.1
1673	1.6
1673*	0.9

^a Data from Figure 7.