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Synthesis Design of Electronegativity Dependent WO_3 and $WO_3 \cdot 0.33H_2O$ Materials for a Better Understanding of TiO_2/WO_3 Composites' Photocatalytic Activity

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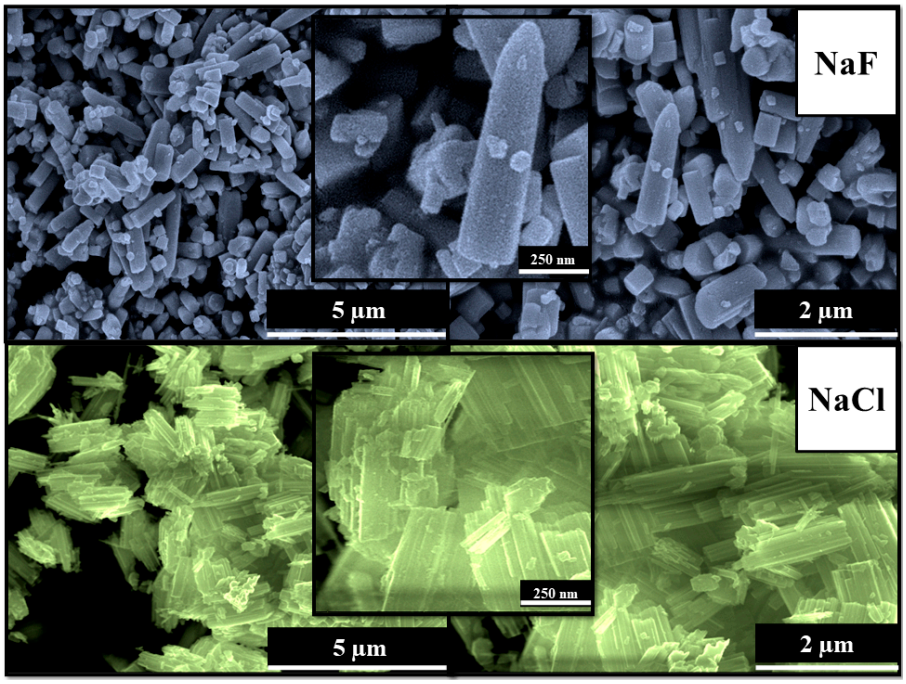

Figure S1. SEM micrographs of WO_3-NWH-NaF (blue) and WO_3-NWH-NaCl (green).

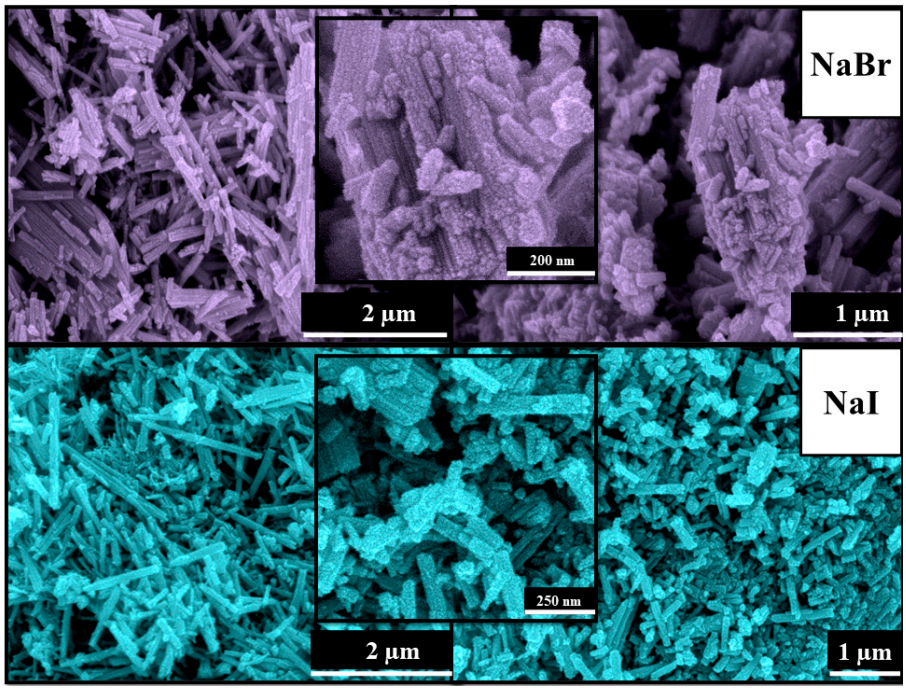

Figure S2. SEM micrographs of WO_3-NWH-NaBr (purple) and WO_3-NWH-NaI (aqua).

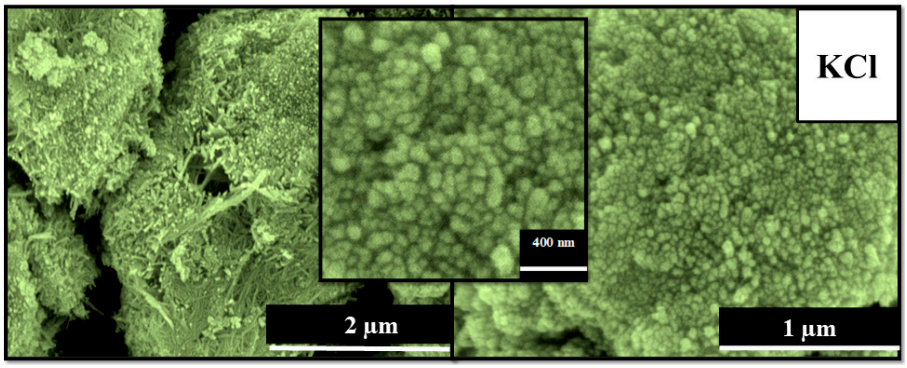

Figure S3. SEM micrographs of WO_3-NWH-KCl (green).

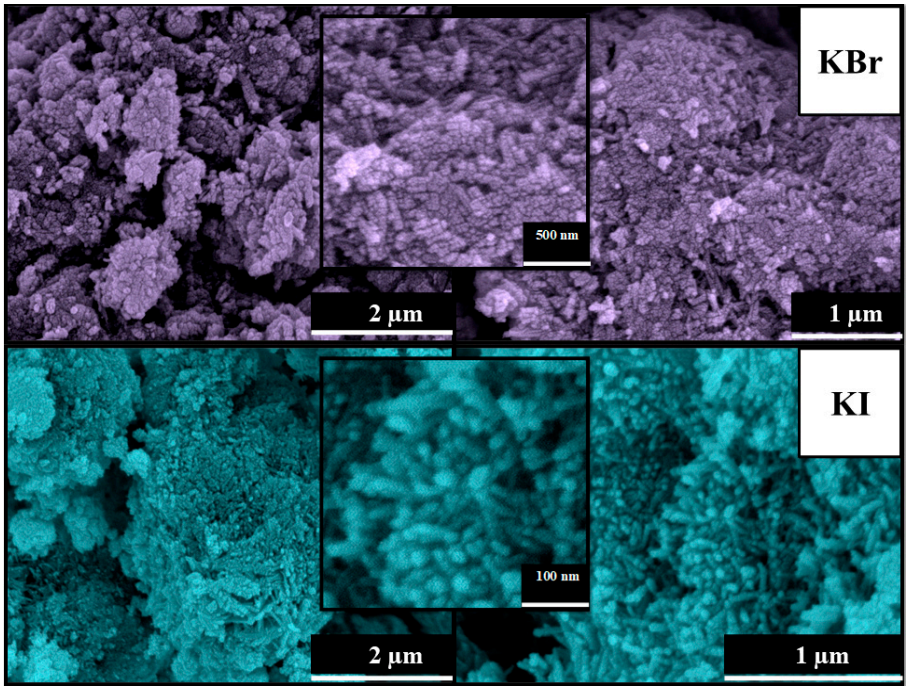

Figure S4. SEM micrographs of WO_3-NWH-KBr (purple) and WO_3-NWH-KI (aqua).

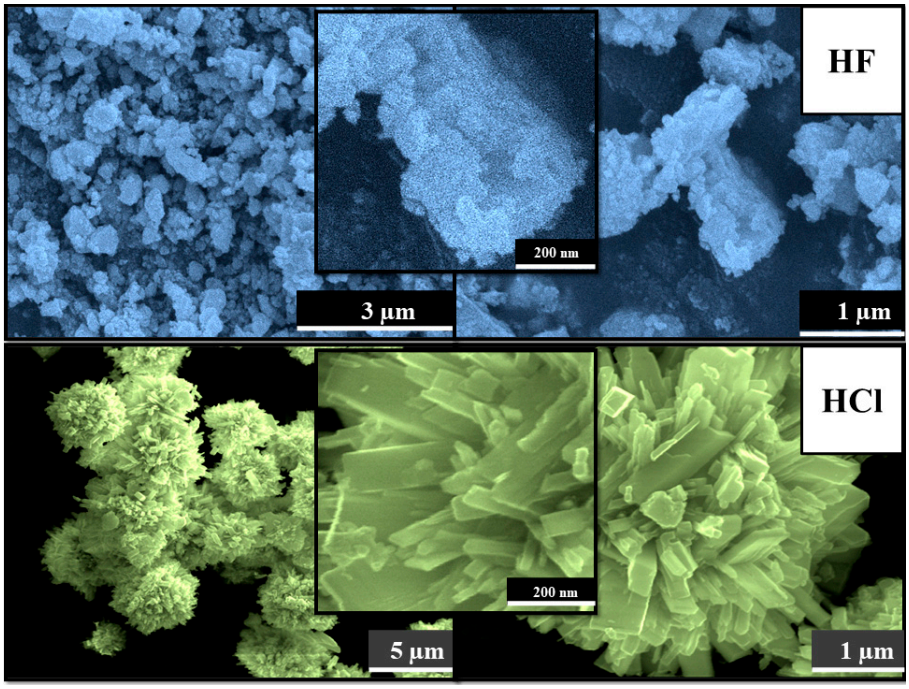

Figure S5. SEM micrographs of WO_3-AMT-HF (blue) and WO_3-AMT-HCl (green).

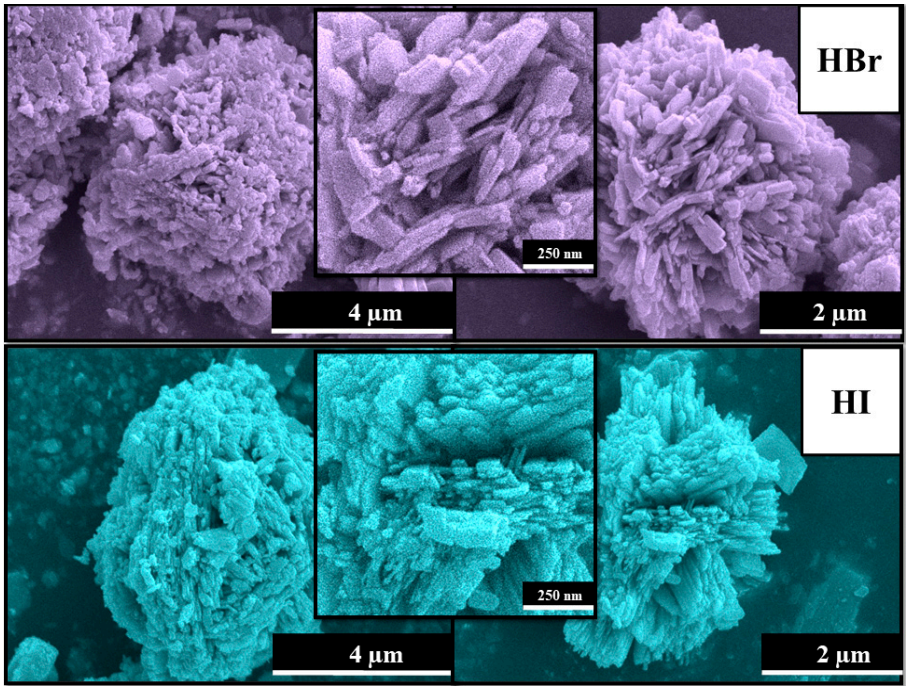

Figure S6. SEM micrographs of WO_3-AMT-HBr (purple) and WO_3-AMT-HI (aqua).

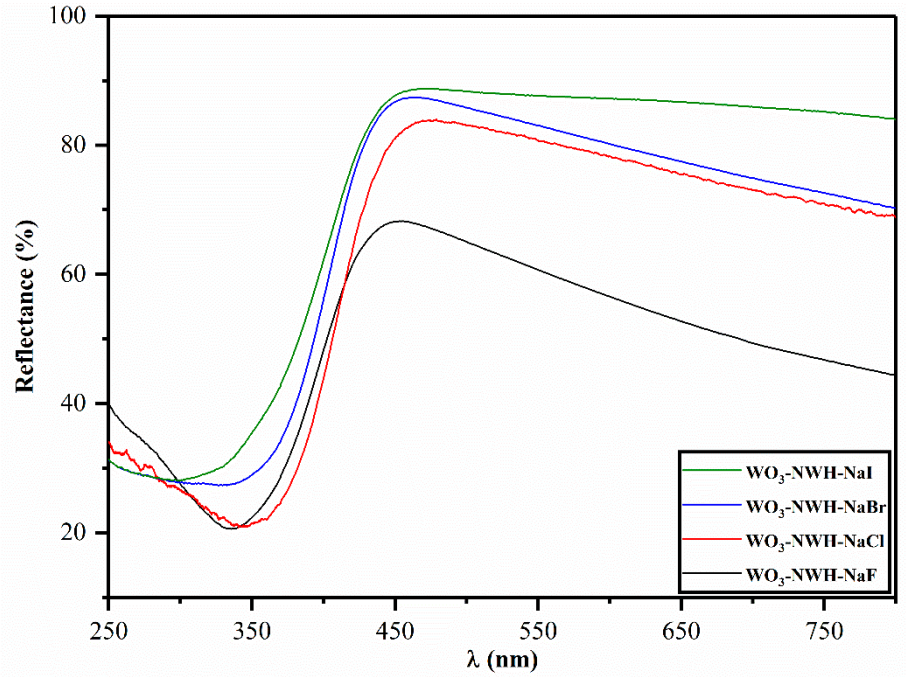

Figure S7. The UV-Vis reflectance spectra of the WO_3-NWH-NaX series.

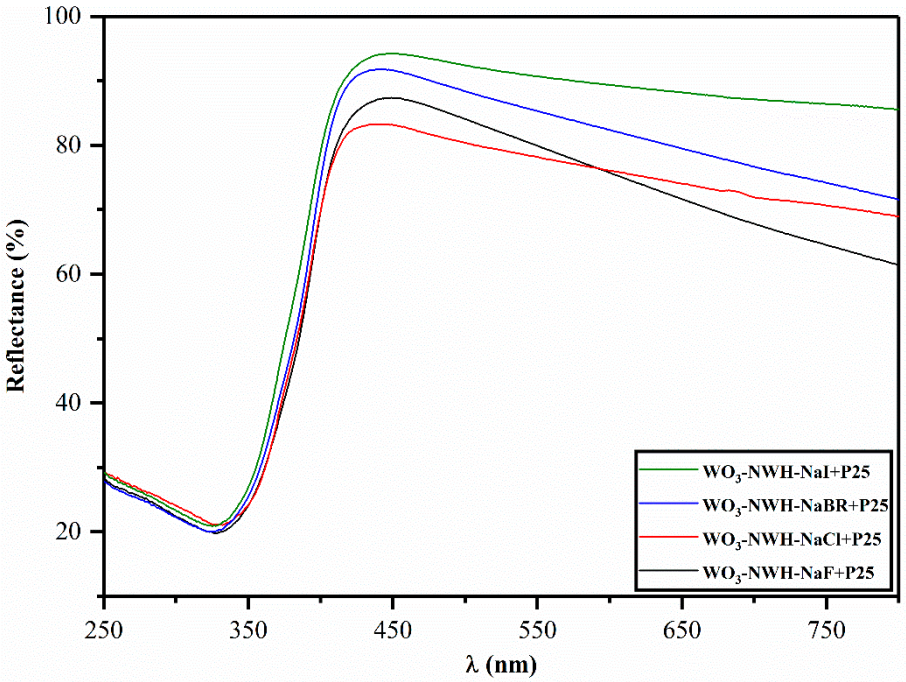

Figure S8. The UV-Vis reflectance spectra of the WO_3-NWH-NaX+P25 composite series.

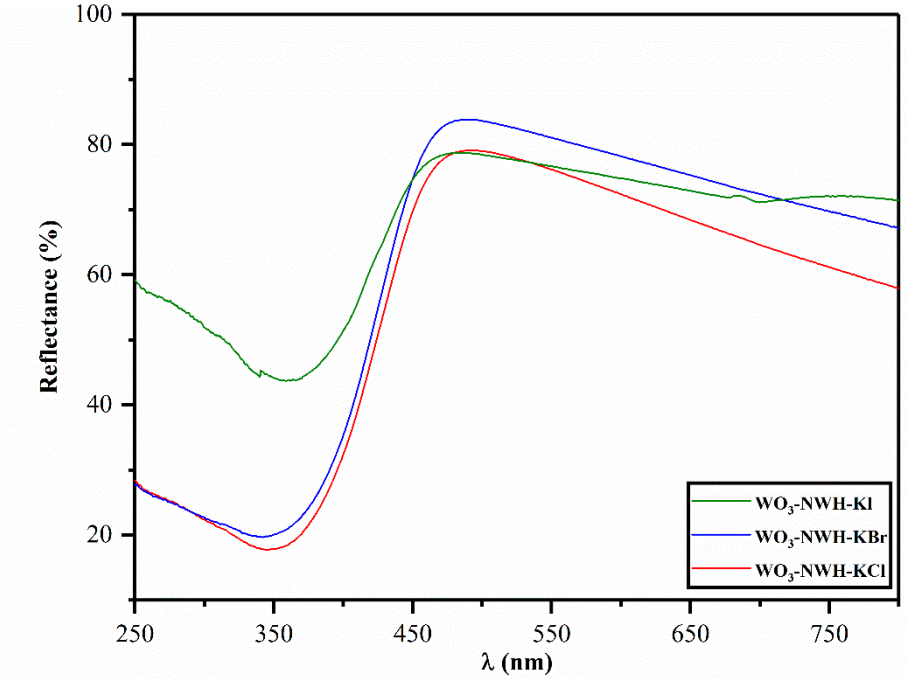

Figure S9. The UV-Vis reflectance spectra of the WO_3-NWH-KX series.

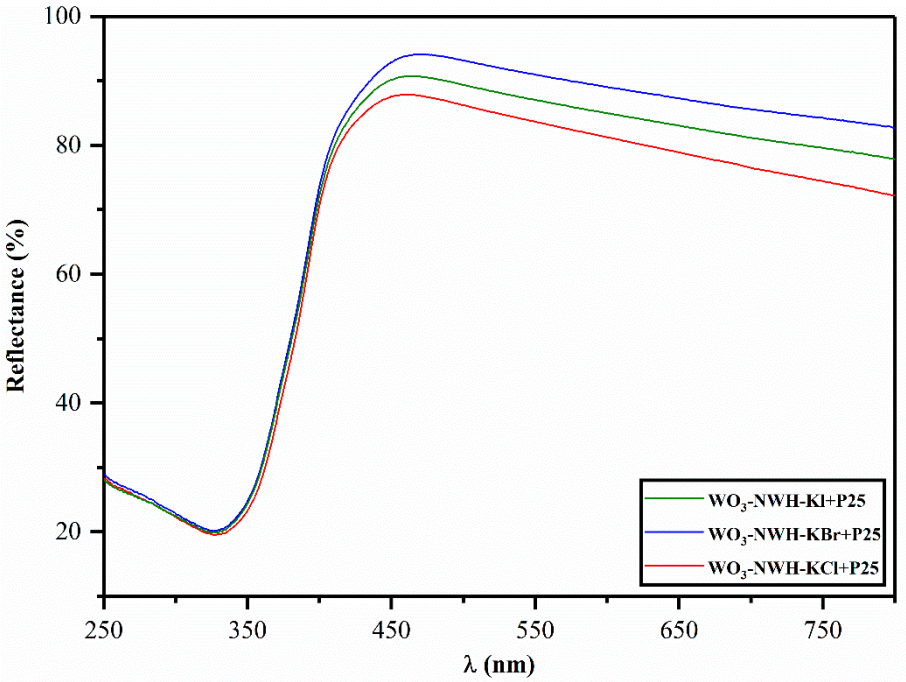

Figure S10. The UV-Vis reflectance spectra of the WO_3-NWH-KX+P25 composite series.

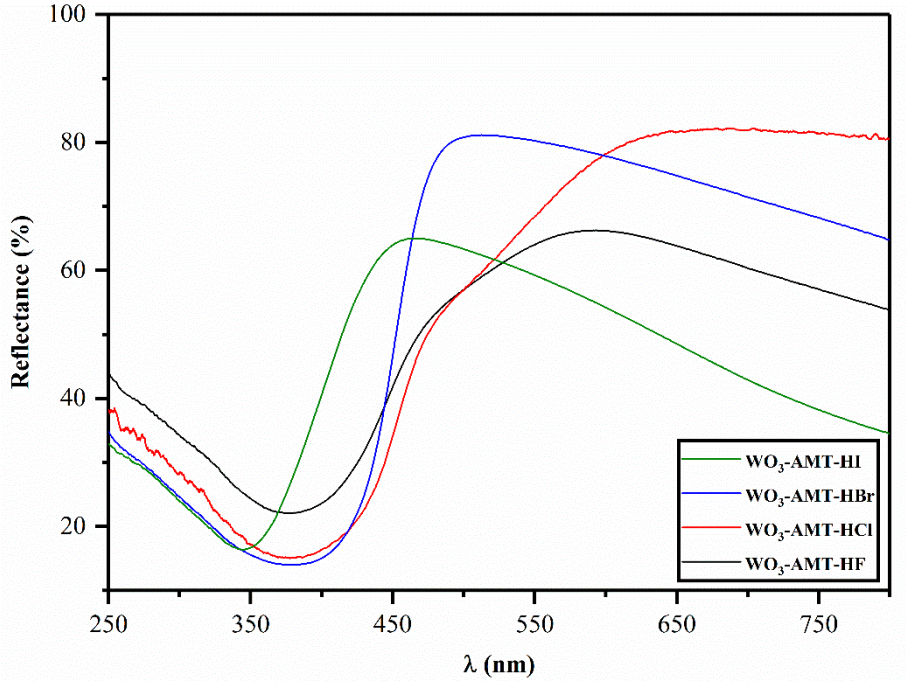

Figure S11. The UV-Vis reflectance spectra of the WO_3-AMT-HX series.

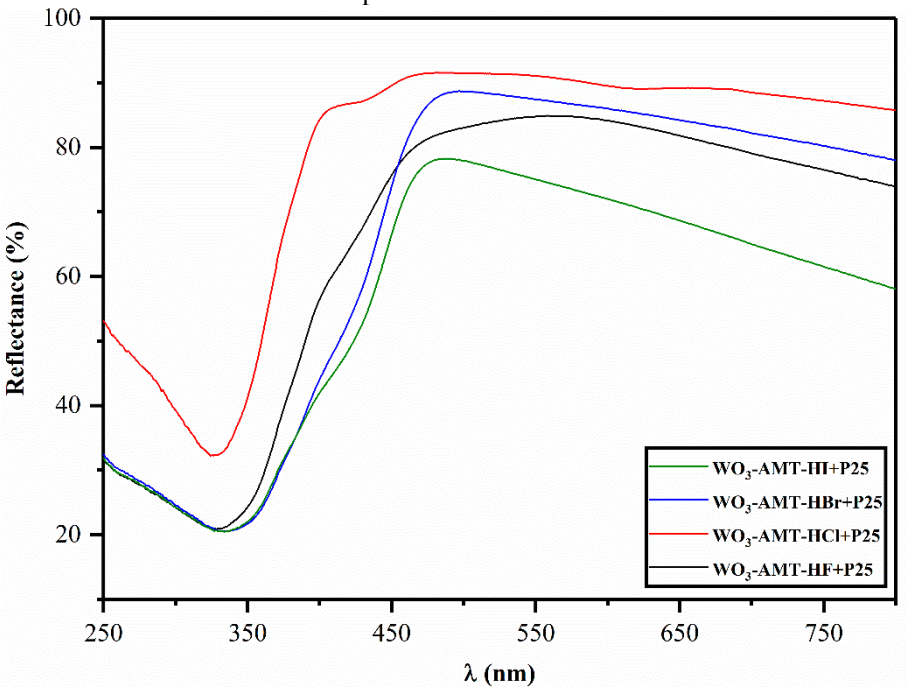

Figure S12. The UV-Vis reflectance spectra of the WO_3-AMT-HX+P25 composite series.

Table S1. Electronegativity of the applied cations and anions and their corresponding acids/salts.

Cation	Electronegativity	Anion	Electronegativity	Acid/Salt	Electronegativity
H^+	2.20	F^-	3.98	HF	1.78
		Cl^-	3.16	HCl	0.96
		Br^-	2.96	HBr	0.76
		I^-	2.66	HI	0.46
Na^+	0.93	F^-	3.98	NaF	3.05
		Cl^-	3.16	NaCl	2.23
		Br^-	2.96	NaBr	2.03
		I^-	2.66	NaI	1.73
K^+	0.82	F^-	3.98	KF	3.16
		Cl^-	3.16	KCl	2.34
		Br^-	2.96	KBr	2.14
		I^-	2.66	KI	1.84

Table S2. Distribution of W, O, Na, K and C species in percentage from the XPS spectra for each synthesized semiconductor.

	Sample										
Species	NWH-NaF	NWH-NaCl	NWH-NaBr	NWH-NaI	NWH-KCl	NWH-KBr	NWH-KI	AMT-HF	AMT-HCl	AMT-HBr	AMT-HI
W4f	26.21	30.67	31.15	26.51	35.57	33.86	36.97	13.65	20.34	26.48	29.00
W^{5+}	3.07	4.06	2.70	4.10	3.24	1.87	1.87	5.73	2.35	1.92	2.40
W^{6+}	25.41	29.42	30.31	25.42	34.42	33.23	36.28	12.87	19.86	25.97	28.30
W^{5+}	0.80	1.25	0.84	1.09	1.15	0.63	0.69	0.78	0.48	0.51	0.70
O1s	38.66	49.06	54.79	45.45	52.85	51.19	54.06	33.64	33.84	41.47	45.19
C1s	34.12	17.13	10.85	25.97	1.78	6.70	-	52.59	45.82	32.05	23.56
Na	0.61	3.15	3.21	2.07	0.85	0.88	1.10	0.11	-	-	2.24
K	-	-	-	-	8.95	7.38	7.88	-	-	-	-
F	0.41	-	-	-	-	-	-	-	-	-	-
O1	0.00	0.85	0.81	0.34	0.67	0.11	0.54	1.29	0.40	0.52	0.02
O2	77.78	83.97	87.44	80.48	90.96	87.45	88.04	67.03	68.46	76.16	80.85
O3	16.69	14.53	11.75	15.26	8.24	11.84	11.42	21.31	22.13	18.75	16.61
O3	1.81	3.86	4.68	2.57	4.35	4.58	6.17	~0	0.88	1.99	1.11
O4	5.53	0.65	0.00	3.91	0.12	0.59	0.00	10.38	9.01	4.57	2.52

(W4f – atom distribution in percentage on the samples' surface; W^{5+} - percentage relative to all W atoms; W^{6+} and W^{5+} in percentage in W4f; O1 – W-OH in percentage – W^{5+} - related interstitial vacancies -; O2 – W=O related crystal framework; O3 – adsorbed materials containing oxygen; O4 – water band).