Supporting Information

Entropy-Mediated Stable Structural Evolution of $(HoErTmYbLu)_{0.2}TaO_4$ for High-Temperature Thermosensitive Applications

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Table S1 Lattice parameters of $RETaO_4$ ceramics.

$RETaO_4$	**a**	**b**	**c**	**α**	**β**	**γ**
$HoTaO_4$	5.3291	10.9329	5.0548	90	95.524	90
$ErTaO_4$	5.306	10.893	5.042	90	95.73	90
$TmTaO_4$	5.2769	5.438	5.0904	90	96.394	90
$YbTaO_4$	5.2508	5.4241	5.0678	90	96.171	90
$LuTaO_4$	5.238	5.425	5.057	90	96.04	90
$(5RE)_{0.2}TaO_4$	5.2655	5.4376	5.0806	90	96.272	90

Table S2 Comparison of this work and the latest research progress in high-temperature thermosensitive ceramics.

Samples	Temperature Range (°C)	Ageing Temperature (K)	*B* (K)	Aging coefficient after stabilization (%)
$0.6MgAl_2O_4$-$0.4LaCr_{0.5}Mn_{0.5}O_3$[1]	573−273	1273	4163-8711	10
$CeNbO_4$[2]	300-1523	1173	7547	19.73
$(La_{0.2}Ce_{0.2}Nd_{0.2}Sm_{0.2}Eu_{0.2})NbO_4$[2]	300-1523	1173	4779	0.42
$Ce_{1-2x}(NdSm)_x(VNbTa)_{1/3}O_{4+\delta}$[3]	50−700	873	4600-6000	0.23-2.6
CeNbO4-based[4]	300−1623	1273	4697-5009	0.17-20
$(HoErTmYbLu)_{0.2}TaO_4$ (This work)	673-1773	1773	12851	3

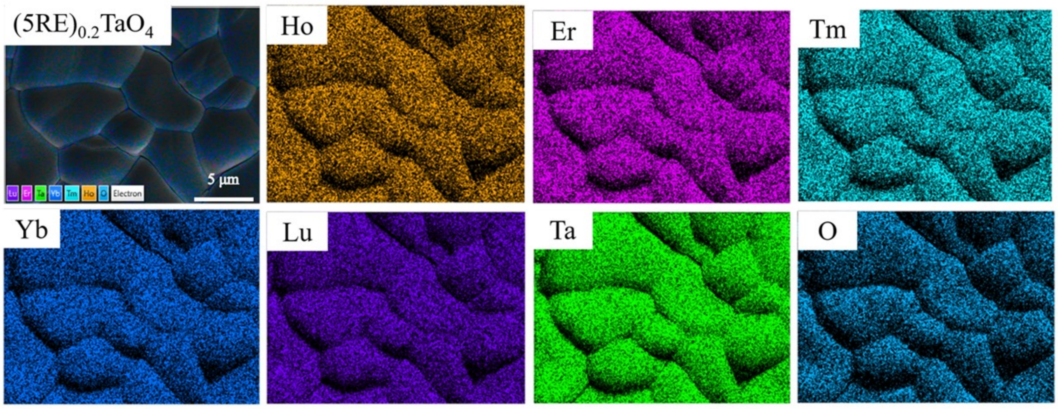

Fig. S1 Element distribution of $(5RE)_{0.2}TaO_4$.

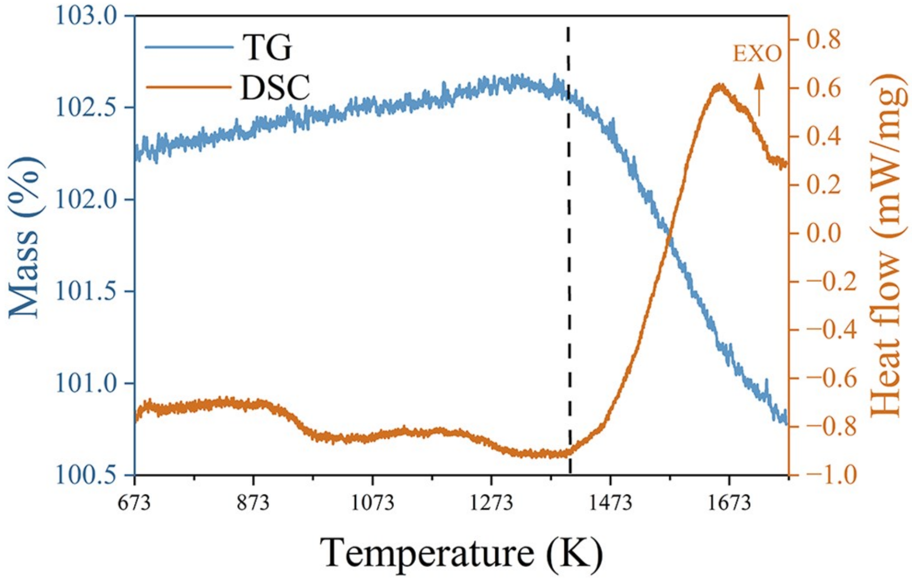

Fig. S2 TG-DSC curves of $(5RE)_{0.2}TaO_4$ under an air atmosphere.

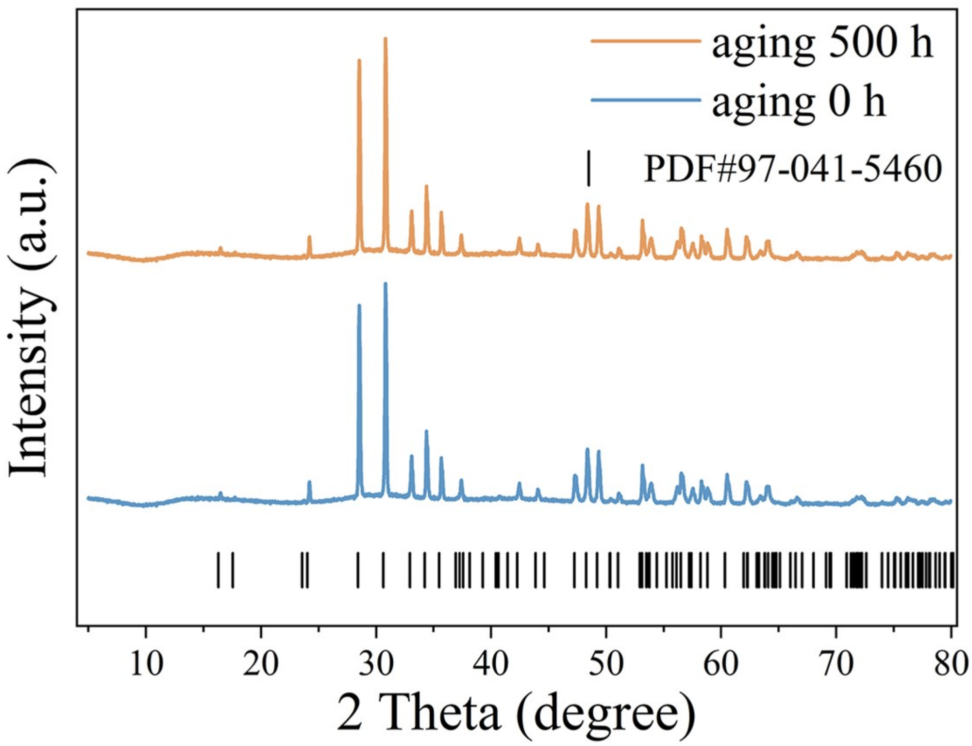

Fig. S3 XRD patterns of $(5RE)_{0.2}TaO_4$ before and after aging.

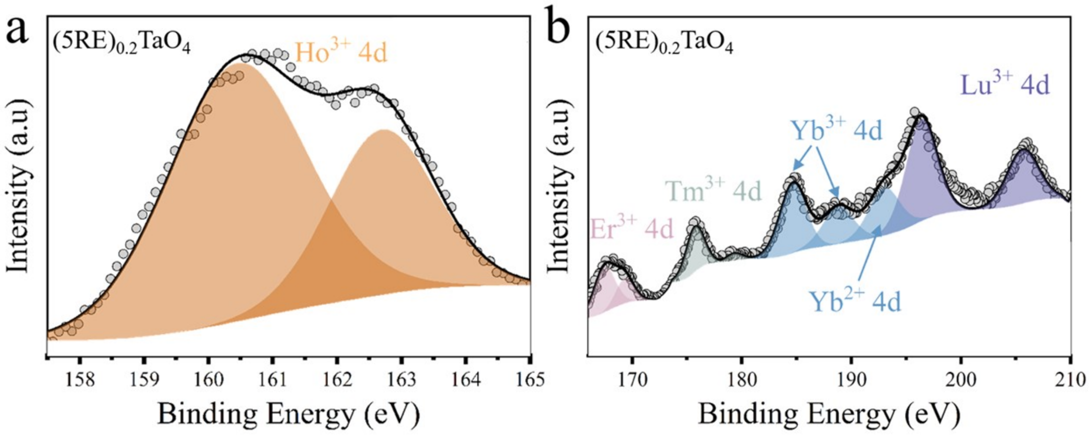

Fig. S4 XPS spectra of the $(5RE)_{0.2}TaO_4$. (a) Ho 4d XPS spectra. (b) Er 4d, Tm 4d, Yb 4d and Lu 4d XPS spectra.

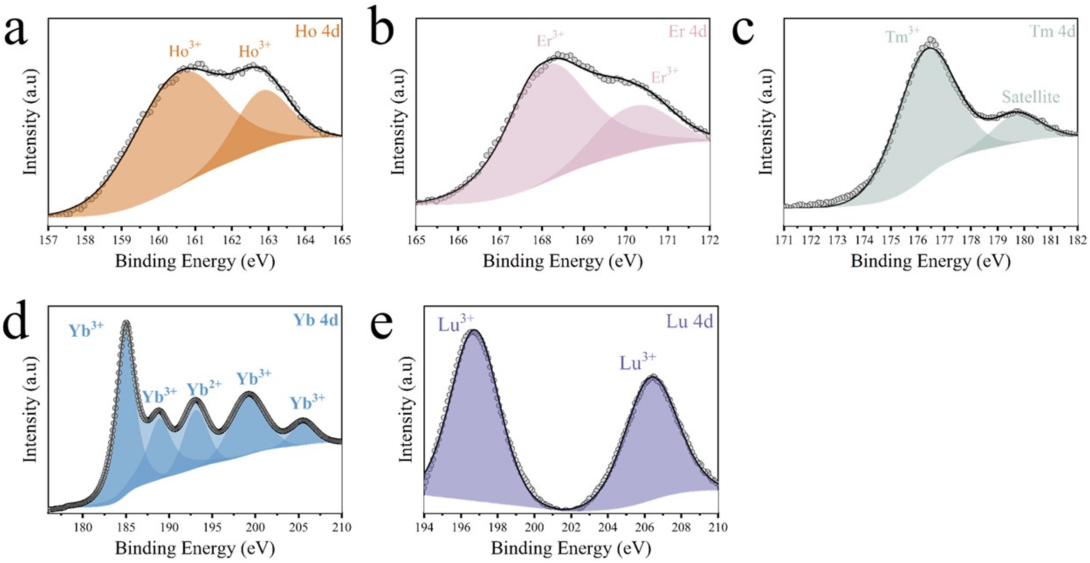

Fig. S5 XPS spectra of all samples except the $(5RE)_{0.2}TaO_4$. (a) Ho 4d XPS spectra of $HoTaO_4$. (b) Er 4dXPS spectra of $ErTaO_4$. (c) Tm 4d XPS spectra of $TmTaO_4$. (d) Yb 4d XPS spectra of $YbTaO_4$. (e) Lu 4dXPS spectra of $LuTaO_4$.

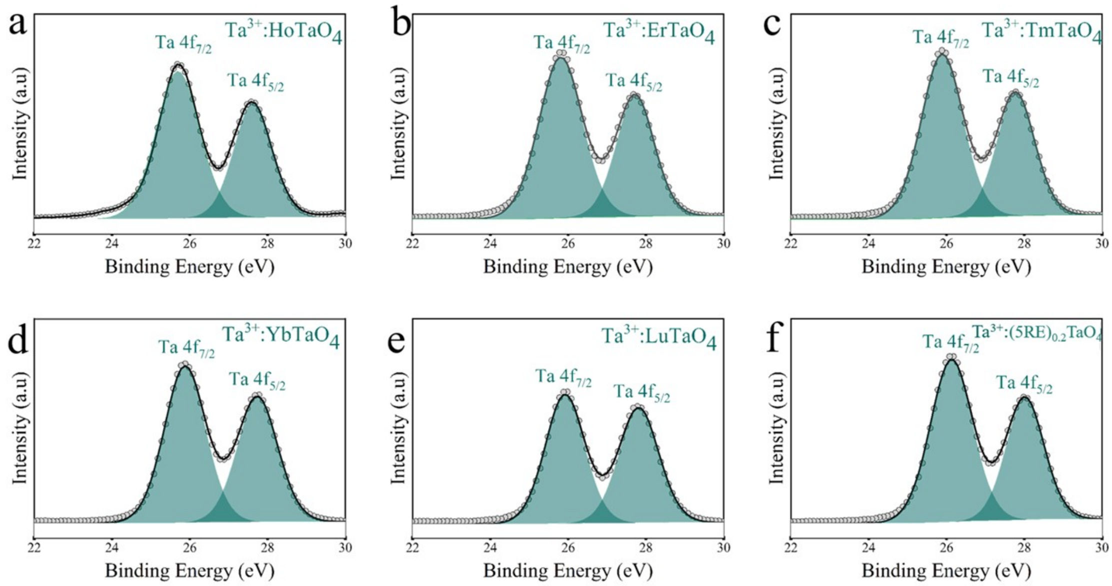

Fig. S6 Ta 4f XPS spectra of all samples. (a)Ta 4f XPS spectra of $HoTaO_4$. (b) Ta 4f XPS spectra of $ErTaO_4$. (c) Ta 4f XPS spectra of $TmTaO_4$. (d) Ta 4f XPS spectra of $YbTaO_4$. (e) Ta 4f XPS spectra of $LuTaO_4$. (f) Ta 4f XPS spectra of $(5RE)_{0.2}TaO_4$.

References

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