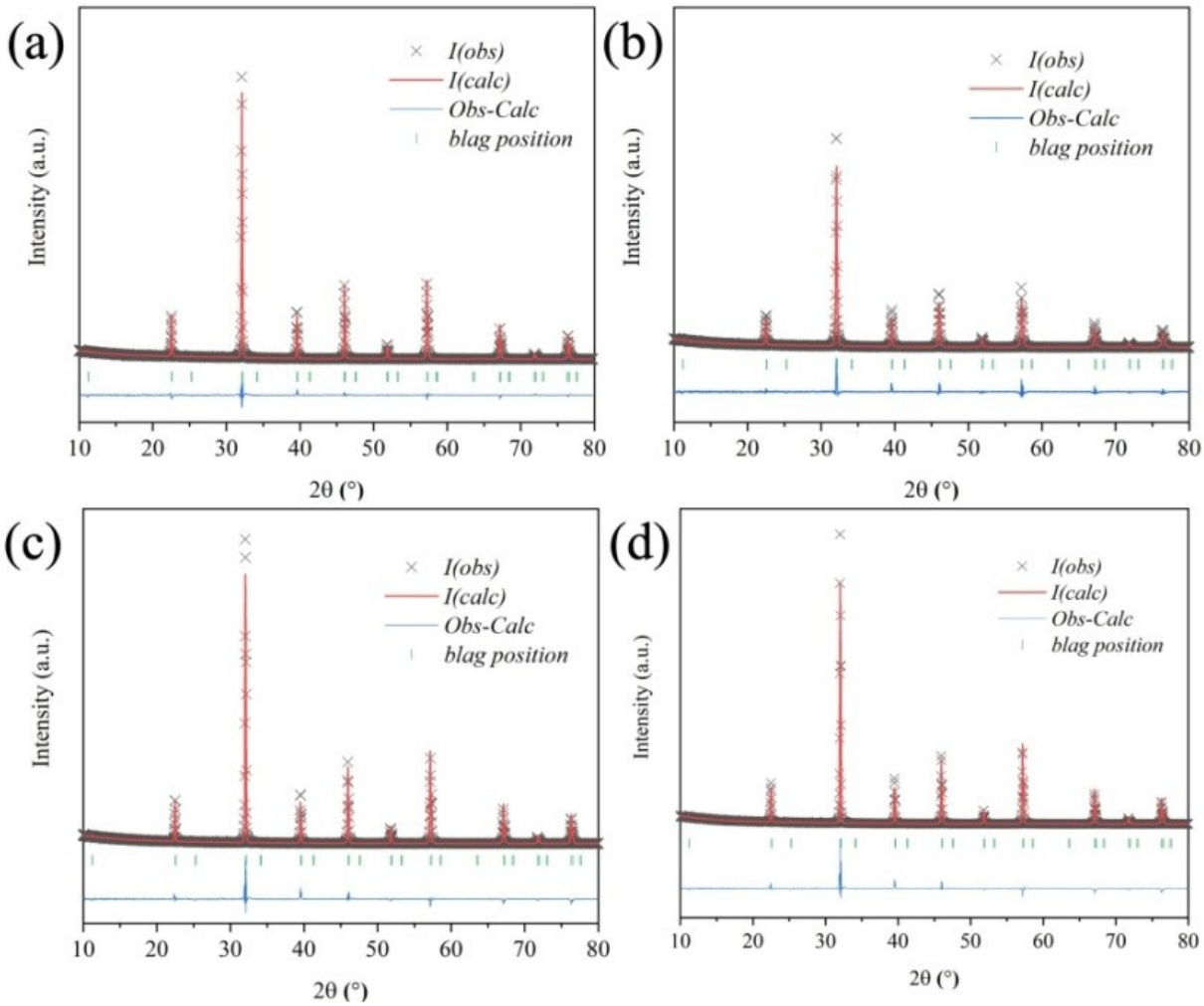

Fig. S1 (a~d) Rietveld refinement patterns of $LBFZ_x$ samples (x=0, 0.05, 0.15 and 0.2)

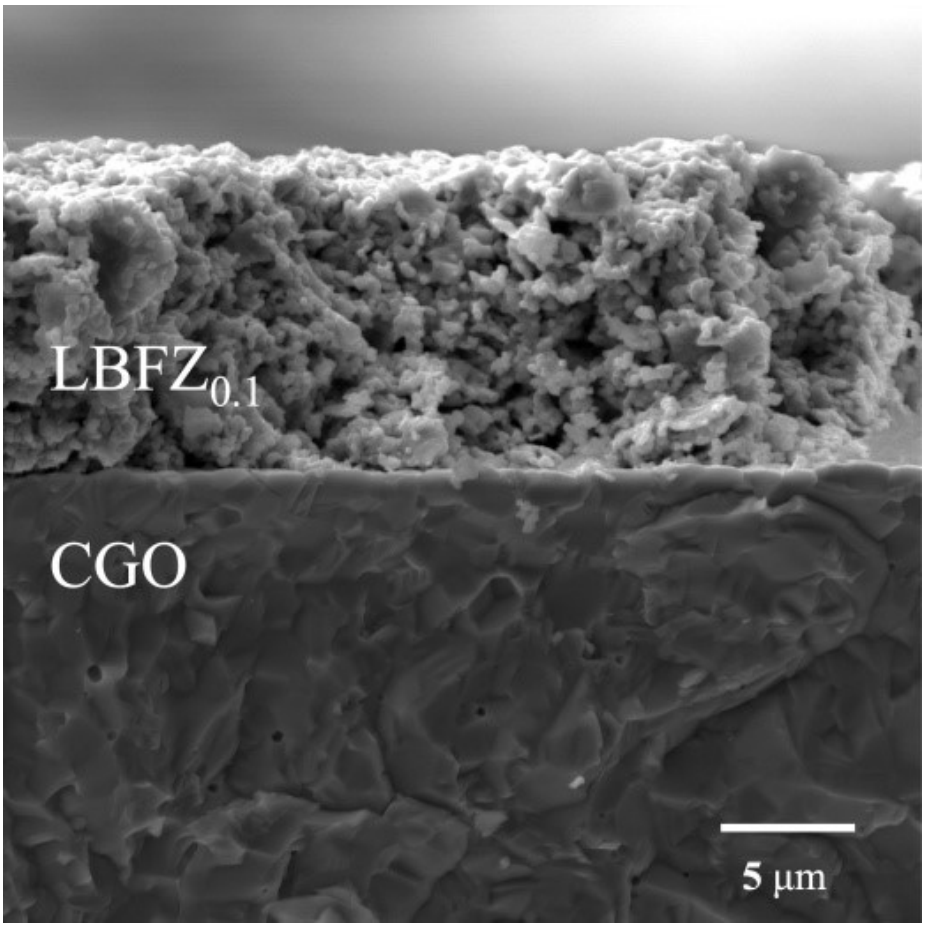

Fig.S2 SEM image of $LBFZ_{0.1}$|CGO cross-section

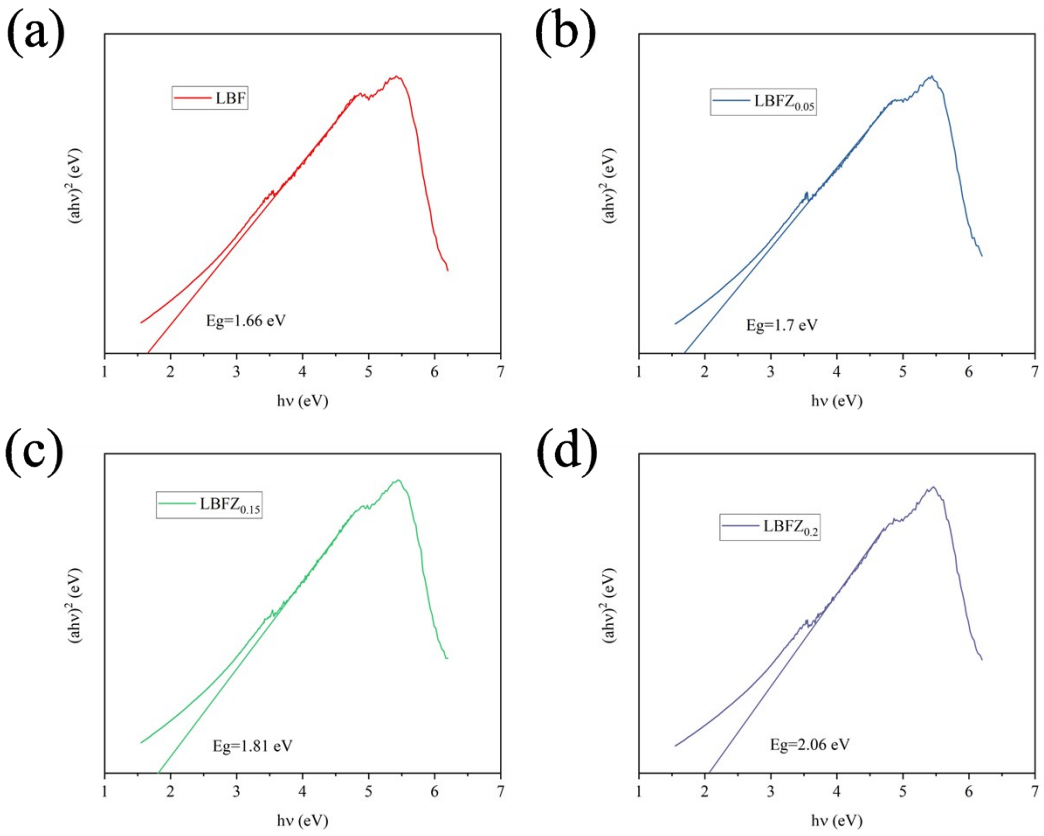

Figure S3 Tauc curves for $LBFZ_x$ (x=0, 0.05, 0.15 and 0.2)

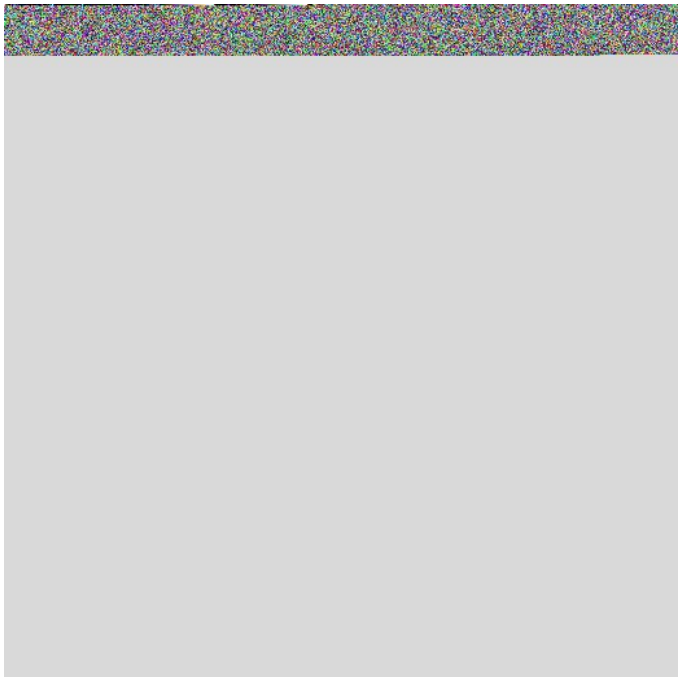

Figure S4 SEM image of $LBFZ_{0.1}$|CGO cross-section

Table S1 Rietveld refinement results of $LBFZ_x$

Sample		LBF	$LBFZ_{0.5}$	$LBFZ_{0.1}$	$LBFZ_{0.15}$	$LBFZ_{0.2}$
Space group		P4/mmm	P4/mmm	P4/mmm	P4/mmm	P4/mmm
	a=b(Å)	3.94095	3.94105	3.94124	3.94213	3.94353
Lattice	c(Å)	7.87891	7.87970	7.88047	7.88209	7.88340
parameters	V(Å^3)	122.3681	122.3866	122.4104	122.4908	122.5982
		La,0,0,0.5	La,0,0,0.5	La,0,0,0.5	La,0,0,0.5	La,0,0,0.5
		Occupancy=1	Occupancy=1	Occupancy=1	Occupancy=1	Occupancy=1
		Ba,0,0,0	Ba,0,0,0	Ba,0,0,0	Ba,0,0,0	Ba,0,0,0
		Occupancy=1	Occupancy=1	Occupancy=1	Occupancy=1	Occupancy=1
		Fe,0.5,0.5,0.25	Fe,0.5,0.5,0.25	Fe,0.5,0.5,0.25	Fe,0.5,0.5,0.25	Fe,0.5,0.5,0.25
	Atom	Occupancy=1	Occupancy=0.95	Occupancy=0.9	Occupancy=0.85	Occupancy=0.8
	position		Zn,0.5,0.5,0.25	Zn,0.5,0.5,0.25	Zn,0.5,0.5,0.25	Zn,0.5,0.5,0.25
			Occupancy=0.05	Occupancy=0.1	Occupancy=0.15	Occupancy=0.2
		O1,0.5,0.5,0.5	O1,0.5,0.5,0.5	O1,0.5,0.5,0.5	O1,0.5,0.5,0.5	O1,0.5,0.5,0.5
		Occupancy=1	Occupancy=1	Occupancy=1	Occupancy=1	Occupancy=1
		O2,0,0.5,0.25	O2,0,0.5,0.25	O2,0,0.5,0.25	O2,0,0.5,0.25	O2,0,0.5,0.25
		Occupancy=1	Occupancy=1	Occupancy=1	Occupancy=1	Occupancy=1
		O3,0.5,0.5,0	O3,0.5,0.5,0	O3,0.5,0.5,0	O3,0.5,0.5,0	O3,0.5,0.5,0
		Occupancy=1	Occupancy=1	Occupancy=1	Occupancy=1	Occupancy=1
Refinement	R_p	7.74%	4.45%	4.09%	4.46%	5.06%
Parameters	R_{wp}	12.6%	10.07%	9.65%	11.52%	11.57%
	χ^2	2.679	1.956	1.800	2.24	2.169

Table S2 Oxygen content of $LBFZ_x$, oxygen vacancy, average valence of Fe^{n+}

$LBFZ_x$	5+δ	Oxygen vacancy	Fe^{n+} average state
x=0.00	5.822	0.178	3.322
x=0.05	5.817	0.183	3.351
x=0.10	5.80	0.20	3.366
x=0.15	5.796	0.204	3.401
x=0.20	5.793	0.207	3.437

Table S3 XPS percentage values for Fe and O elements

Sample	Fe^{3+}（%）	Fe^{4+}（%）	$(O_{adsorbed}+O_{vacancy})$（%）	（$O_{adsorbed}+O_{vacancy}$）/$O_{Lattice}$
x=0.00	53.9	46.1	61.21	2.2797
x=0.05	51.92	48.08	61.97	2.3167
x=0.10	49.76	50.24	64.11	2.4358
x=0.15	48.99	51.01	65.18	2.5293
x=0.20	47.12	52.88	65.32	2.5506

Table S4 Average thermal expansion coefficient of $LBFZ_x$ (K^{-1})

Sample	30~300 °C	300~750 °C	30~750 °C
$LaBaFeO_{5+\delta}$	6.45×10^{-6}	21.2×10^{-6}	13.2×10^{-6}
$LaBaFe_{1.95}Zn_{0.5}O_{5+\delta}$	6.22×10^{-6}	20.6×10^{-6}	12.9×10^{-6}
$LaBaFe_{1.9}Zn_{0.1}O_{5+\delta}$	6.11×10^{-6}	18.9×10^{-6}	11.8×10^{-6}
$LaBaFe_{1.85}Zn_{0.15}O_{5+\delta}$	4.74×10^{-6}	18.8×10^{-6}	11.7×10^{-6}
$LaBaFe_{1.8}Zn_{0.2}O_{5+\delta}$	6.04×10^{-6}	18.3×10^{-6}	11.4×10^{-6}