
No. 1C-c8 (Sr,Pb)(Ti,Zr)O₃

1b Phase diagram: Fig. 1C-c8-001, Fig. 1C-c8-002.

3a Lattice parameter: Fig. 1C-c8-003.

5a Dielectric constant: Fig. 1C-c8-004, Fig. 1C-c8-005; Table 1C-c8-001.

d Pyroelectricity: Table 1C-c8-001.

7 Electromechanical properties: Table 1C-c8-002, Table 1C-c8-003.

a Piezoelectricity: Table 1C-c8-001, Table 1C-c8-003.

Table 1C-c8-001. 0.98 (Pb_{1-y}Sr_y)(Ti_{1-x}Zr_x)O₃·0.02 Zn(Bi_{2/3}Mn_{1/3})O₃ (ceramics). Pyroelectric, piezoelectric and dielectric properties [80Che].

x	p_3 [·10 ⁻⁴ Cm ⁻² K ⁻¹]			d_{31} [·10 ⁻¹² CN ⁻¹]			κ			p_3/κ [·10 ⁻⁵ Cm ⁻² K ⁻¹]		
	y=0	0.05	0.07	0	0.05	0.07	0	0.05	0.07	0	0.05	0.07
0.30	1.9	1.3	2.0	15	12	17	250	260	290	0.08	0.05	0.07
0.42	2.2	2.5	2.6	32	31	33	460	430	490	0.05	0.06	0.05
0.46	2.8	3.0	2.9	47	44	51	560	560	660	0.05	0.05	0.04
0.50	3.2	3.1	3.1	70	67	76	710	680	880	0.05	0.03	0.04
0.52	3.3	3.7	3.7	90	97	103	810	800	1070	0.04	0.05	0.03
0.54	3.9	4.0	4.2	72	85	101	510	810	940	0.08	0.05	0.04
0.56	3.5	4.0	4.4	53	63	76	360	630	600	0.10	0.06	0.07
0.59	3.2	3.6	3.8	43	48	50	335	510	450	0.10	0.07	0.08
0.62	3.5	3.4	3.7	34	37	46	275	440	410	0.13	0.08	0.09
0.69	3.3	2.9	3.8	22	25	28	230	335	310	0.14	0.09	0.12
0.73	3.4	—	—	18	—	—	210	—	—	0.16	—	—

Table 1C-c8-002. $(\text{Pb}_{1-x}\text{Ca}_x)(\text{Zr}_{1-y}\text{Ti}_y)\text{O}_3$ and $(\text{Pb}_{1-x}\text{Sr}_x)(\text{Zr}_{1-y}\text{Ti}_y)\text{O}_3$ (modified ceramics). Electromechanical characteristics [59Kul1].

Composition	ρ_a	κ	24 h after poling						Θ_f
			κ	$\tan \delta$	k_p	d_{31}	g_{31}	$(s_{11}^E)^{-1}$	
			at 1 kHz	[%] at 1 kHz		$[\cdot 10^{-12}$ C N $^{-1}$]	$[\cdot 10^{-3}$ m 2 C $^{-1}$]	$[\cdot 10^{10}$ N m $^{-2}$]	
$\text{Pb}(\text{Zr}_{0.53}\text{Ti}_{0.47})\text{O}_3$	7.40	736	544	0.5	0.48	71	14.7	7.67	385
$\text{Pb}(\text{Zr}_{0.53}\text{Ti}_{0.47})\text{O}_3$	7.39	707	542	0.4	0.47	69	14.4	7.76	
$(\text{Pb}_{0.99}\text{Ca}_{0.01})(\text{Zr}_{0.53}\text{Ti}_{0.47})\text{O}_3$	7.42	729	624	0.5	0.49	77	13.9	7.89	
$(\text{Pb}_{0.95}\text{Ca}_{0.05})(\text{Zr}_{0.53}\text{Ti}_{0.47})\text{O}_3$	7.26	832	973	0.5	0.44	88	10.2	7.62	
$(\text{Pb}_{0.92}\text{Ca}_{0.08})(\text{Zr}_{0.53}\text{Ti}_{0.47})\text{O}_3$	6.86	794	888	0.4	0.32	60	7.6	7.85	
$(\text{Pb}_{0.99}\text{Sr}_{0.01})(\text{Zr}_{0.53}\text{Ti}_{0.47})\text{O}_3$	7.42	755	584	0.6	0.49	75	14.5	7.68	
$(\text{Pb}_{0.95}\text{Sr}_{0.05})(\text{Zr}_{0.53}\text{Ti}_{0.47})\text{O}_3$	7.47	920	1002	0.4	0.50	101	11.4	7.65	360
$(\text{Pb}_{0.925}\text{Sr}_{0.075})(\text{Zr}_{0.53}\text{Ti}_{0.47})\text{O}_3$	7.29	942	1094	0.3	0.50	103	10.6	7.94	
$(\text{Pb}_{0.90}\text{Sr}_{0.10})(\text{Zr}_{0.53}\text{Ti}_{0.47})\text{O}_3$	7.22	997	1129	0.3	0.49	103	10.3	7.95	290
$(\text{Pb}_{0.875}\text{Sr}_{0.125})(\text{Zr}_{0.47}\text{Ti}_{0.53})\text{O}_3$	7.09	609	663	0.3	0.28	40	6.8	9.91	
$(\text{Pb}_{0.875}\text{Sr}_{0.125})(\text{Zr}_{0.50}\text{Ti}_{0.50})\text{O}_3$	7.11	813	880	0.3	0.33	57	7.3	9.05	
$(\text{Pb}_{0.875}\text{Sr}_{0.125})(\text{Zr}_{0.52}\text{Ti}_{0.48})\text{O}_3$	7.10	973	1149	0.3	0.44	91	9.0	8.32	
$(\text{Pb}_{0.875}\text{Sr}_{0.125})(\text{Zr}_{0.53}\text{Ti}_{0.47})\text{O}_3$	7.14	1076	1237	0.4	0.47	100	9.1	8.06	265
$(\text{Pb}_{0.875}\text{Sr}_{0.125})(\text{Zr}_{0.54}\text{Ti}_{0.46})\text{O}_3$	7.16	1095	1325	0.6	0.51	119	10.1	7.51	
$(\text{Pb}_{0.875}\text{Sr}_{0.125})(\text{Zr}_{0.56}\text{Ti}_{0.44})\text{O}_3$	7.14	1105	1210	0.4	0.51	116	10.8	7.31	
$(\text{Pb}_{0.875}\text{Sr}_{0.125})(\text{Zr}_{0.59}\text{Ti}_{0.41})\text{O}_3$	7.17	919	585	0.4	0.45	66	12.7	8.39	
$(\text{Pb}_{0.85}\text{Sr}_{0.15})(\text{Zr}_{0.53}\text{Ti}_{0.47})\text{O}_3$	6.90	1106	1260	0.5	0.43	97	8.7	7.68	242
$(\text{Pb}_{0.80}\text{Sr}_{0.20})(\text{Zr}_{0.50}\text{Ti}_{0.50})\text{O}_3$	6.56	941	970	0.6	0.29	56	6.5	8.11	
$(\text{Pb}_{0.80}\text{Sr}_{0.20})(\text{Zr}_{0.53}\text{Ti}_{0.47})\text{O}_3$	6.48	1212	1257	0.5	0.34	86	7.8	7.05	
$(\text{Pb}_{0.80}\text{Sr}_{0.20})(\text{Zr}_{0.54}\text{Ti}_{0.46})\text{O}_3$	6.36	1182	1341	0.8	0.35	91	7.7	6.18	
$(\text{Pb}_{0.80}\text{Sr}_{0.20})(\text{Zr}_{0.55}\text{Ti}_{0.45})\text{O}_3$	6.36	1200	1337	0.8	0.34	86	7.3	6.42	
$(\text{Pb}_{0.80}\text{Sr}_{0.20})(\text{Zr}_{0.56}\text{Ti}_{0.44})\text{O}_3$	6.35	1107	1113	0.7	0.35	81	8.2	6.50	

Table 1C-c8-003. $(\text{Pb}_{0.95}\text{Sr}_{0.05})(\text{Zr}_{0.54}\text{Ti}_{0.46})\text{O}_3$ (ceramics with addition of Nb_2O_5 or Ta_2O_5). Electromechanical characteristics [59Kul2]. $f_R \cdot 2r$: frequency constant of radial mode vibration.

Addition [wt %]	ρ_a [$\cdot 10^3$ kg m^{-3}]	Before poling		24 h after poling					Θ_f [°C]
		κ at 1 kHz	$\tan \delta$ [%] at 1 kHz	κ at 1 kHz	$\tan \delta$ [%] at 1 kHz	k_p	$f_R \cdot 2r$ [Hz m]	d_{31} [$\cdot 10^{-12}$ C N^{-1}]	
1.0 Nb_2O_5	7.34	1291	2.0	1609	2.0	0.56	3024	153	306
2.0 Nb_2O_5	7.22	1380	2.4	1662	2.1	0.47	3124	127	
3.0 Nb_2O_5	6.63	1125	2.1	1301	2.1	0.36	3100	91	
2.0 Ta_2O_5	7.33	1343	2.3	1695	2.0	0.54	3034	151	296

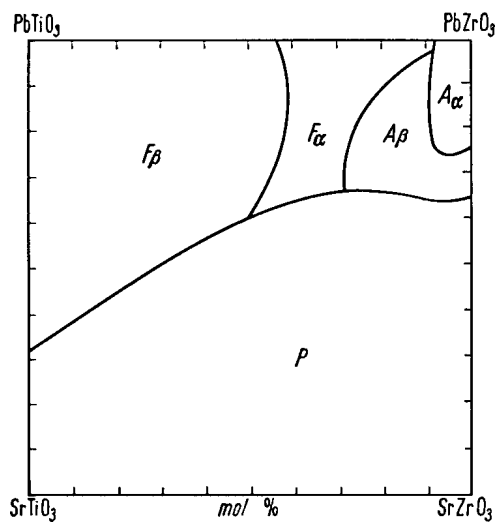


Fig. 1C-c8-001. $(\text{Pb,Sr})(\text{Zr,Ti})\text{O}_3$. Phase diagram [59Ike].

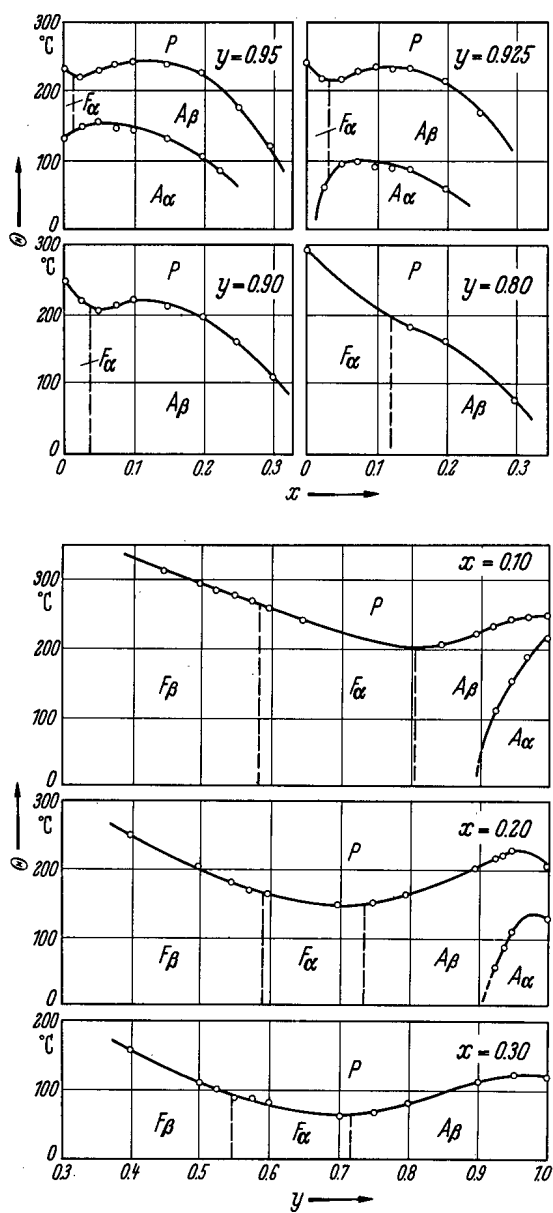


Fig. 1C-c8-002. $(\text{Pb}_{1-x}\text{Sr}_x)(\text{Ti}_{1-y}\text{Zr}_y)\text{O}_3$. Θ vs. x , y [59Ike].

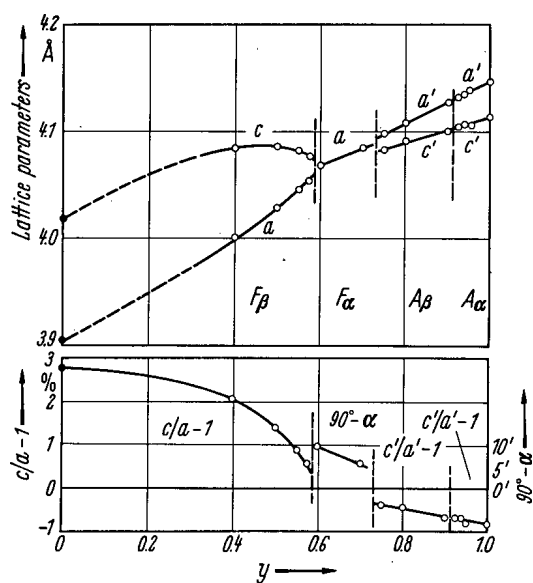


Fig. 1C-c8-003. $(\text{Pb}_{0.8}\text{Sr}_{0.2})(\text{Ti}_{1-y}\text{Zr}_y)\text{O}_3$. Lattice parameters vs. y [59Ike]. a' , c' : lattice parameters of pseudotetragonal unit cell.

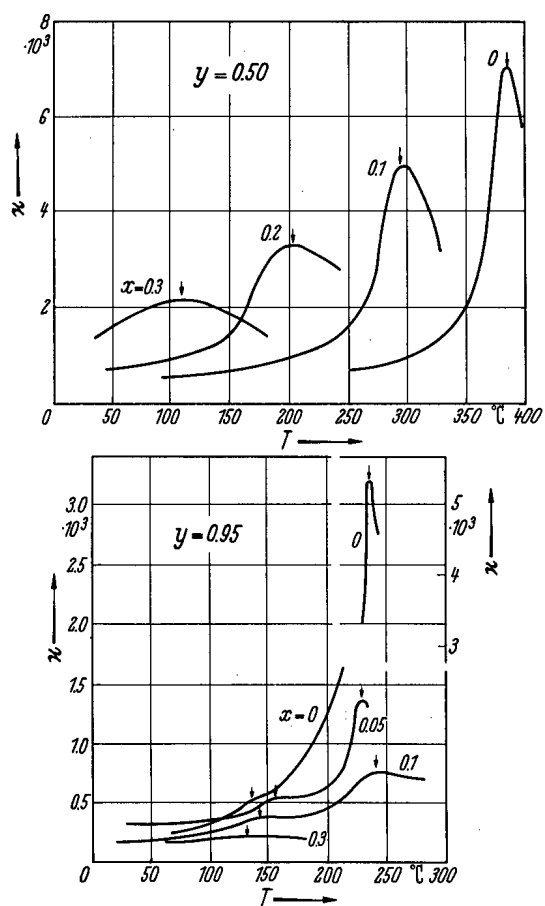


Fig. 1C-c8-004. $(\text{Pb}_{1-x}\text{Sr}_x)(\text{Ti}_{1-y}\text{Zr}_y)\text{O}_3$ (ceramics). κ vs. T [59Ike]. Parameters: x , y . Arrows indicate maxima of κ . $f = 550$ kHz.

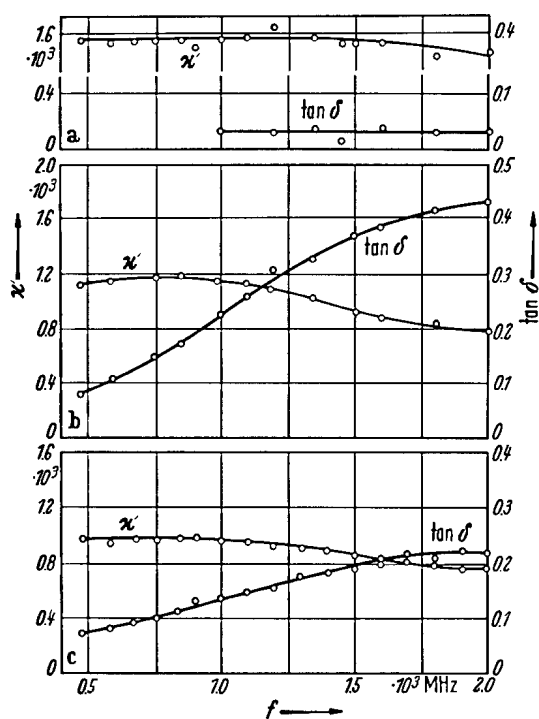


Fig. 1C-c8-005. $(\text{Pb}_{1-x}\text{Sr}_x)(\text{Zr}_{1-y}\text{Ti}_y)\text{O}_3$ (ceramics). κ' , $\tan \delta$ vs. f [63Ger]. (a) $x = 0.65$, $y = 0$, paraelectric. (b) $x = 0.06$, $y = 0.47$, unpoled. (c) $x = 0.06$, $y = 0.47$, poled.

References

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