No. 1C-c20 (Pb,Ca,M)Ti($Co_{1/2}W_{1/2}$)O_3 (M = Sr, Ba)

5a	Dielectric constants: Figs. 1C-c20-001...1C-c20-004; Table 1C-c20-001.
7a	Piezoelectric properties: Table 1C-c20-001.

Table 1C-c20-001. $(Pb_{0.65}Ca_{0.35-x}M_x)Ti_{0.94}(Co_{0.5}W_{0.5})_{0.06}O_3$ (M = Sr, Ba) (ceramics). Dielectric and piezoelectric properties [94Tro].

Property	Composition x [mol %]					
	M = Sr			M = Ba		
	0.02	0.04	0.06	0.02	0.04	0.06
Dielectric constant κ	647	509	441	425	349	316
Dielectric loss tan δ [%]	1.6	1.3	1.4	2.2	2.3	2.6
Transition temperature Θ [°C]	106	120	132	135	158	178
Piezoelectric transverse coefficient d_{31} [$\cdot 10^{-12}$ C/N]	–1.7	–2.5	–3.0	–2.1	–2.1	–2.8
Piezoelectric longitudinal coefficient d_{33} [$\cdot 10^{-12}$ C/N]	70	86	88	77	65	63
Piezoelectric anisotropy d_{33}/d_{31}	44/1	34/1	29/1	36/1	31/1	22/1
Hydrostatic charge coefficient d_h [$\cdot 10^{-12}$ C/N]	66	81	82	73	61	57
Hydrostatic voltage coefficient g_h [$\cdot 10^{-3}$ mV/N]	11	18	12	19	20	20
Figure of merit $d_h g_h$ [$\cdot 10^{-15}$ m^2/N]	726	1458	1722	1387	1220	1140

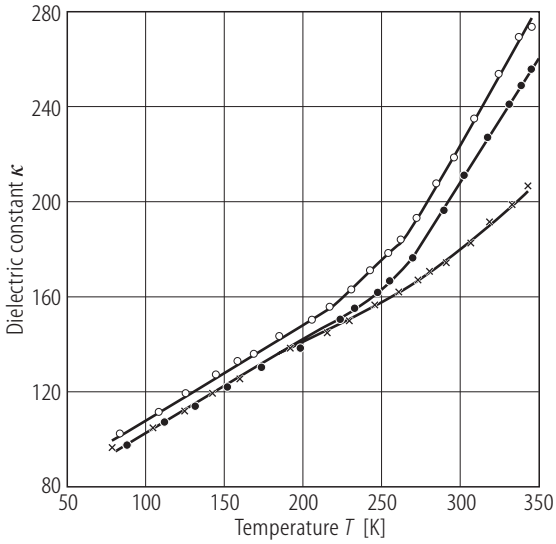

Fig. 1C-c20-001. $(Pb_{0.93}Ca_{0.27})[(Co_{1/2}W_{1/2})_{0.04}Ti_{0.96}]O_3$ (ceramics). κ vs. T [91Nad]. Parameter: composition. f = 1 kHz. Full circles: without additives. Open circles: with 1 mol % MnO_2. Crosses: with 1 mol% NiO.

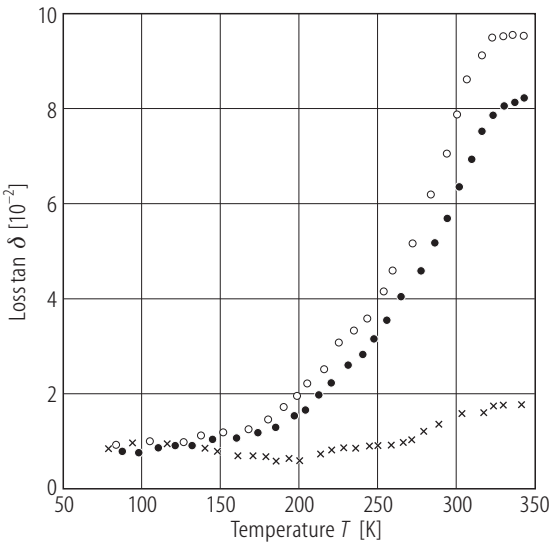

Fig. 1C-c20-002. $(Pb_{0.93}Ca_{0.27})[(Co_{1/2}W_{1/2})_{0.04}Ti_{0.96}]O_3$ (ceramics). tanδ vs. T [91Nad]. Parameter: composition. f = 1 kHz. Full circles: without additives. Open circles: with 1 mol% MnO_2. Crosses: with 1 mol% NiO.

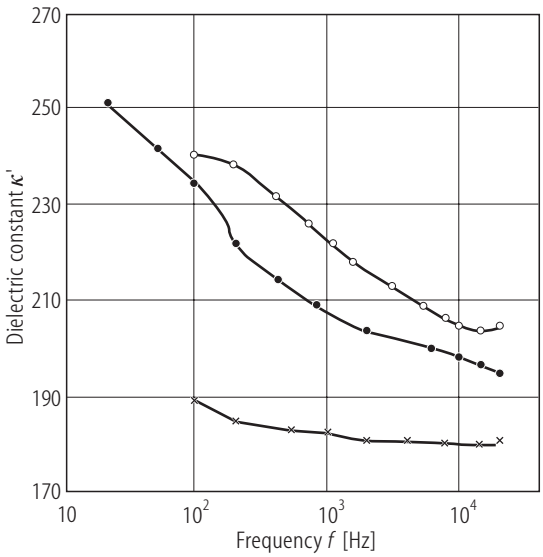

Fig. 1C-c20-003. $(Pb_{0.93}Ca_{0.27})[(Co_{1/2}W_{1/2})_{0.04}Ti_{0.96}]O_3$ (ceramics). κ' vs. f [91Nad]. Parameter: composition. T = RT. Full circles: without additives. Open circles: with 1 mol% MnO_2. Crosses: with 1 mol% NiO.

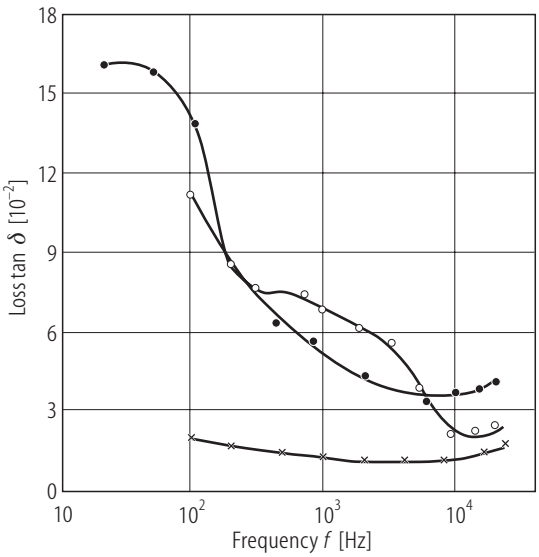

Fig. 1C-c20-004. $(Pb_{0.93}Ca_{0.27})[(Co_{1/2}W_{1/2})_{0.04}Ti_{0.96}]O_3$ (ceramics). $\tan\delta$ vs. f [91Nad]. Parameter: composition. T = RT. Full circles: without additives. Open circles: with 1% MnO_2. Crosses: with 1% NiO.

References

91Nad Nadoliisky, M.M., Vassileva, T.K., Yanchev, R.V.: Ferroelectrics **118** (1991) 111.
94Tro Troilo, L.M., Damjanovic, D., Newnham, R.E.: J. Am. Ceram. Soc. **77** (1994) 857.