No. 1C-b43 $PbTiO_3$–$Pb(Mg_{1/3}Nb_{2/3})O_3$

1b	Phase diagram: Fig. 1C-b43-001; see also	89Cho, 89Kim
2b	Single crystals were grown from $PbO–B_2O_3$ flux (molar ratio 2.65 : 0.35): see	90Shr
5a	Dielectric constant: Temperature dependence: Fig. 1C-b43-002 (crystal), Fig. 1C-b43-003.	
	Frequency dependence: Fig. 1C-b43-004, Fig. 1C-b43-005; see also	89Lan, 94Eli1
	Effect of E_{bias}: Fig. 1C-b43-006. Aging effect: Fig. 1C-b43-007.	
c	Polarization: Fig. 1C-b43-008; see also	90Vie, 91Tay, 93HoJ
d	Pyroelectric effect: Table 1C-b43-001; see also	89Cho
7a	Piezoelectric effect: Table 1C-b43-002, Fig. 1C-b43-009.	
b	Electrostriction: Fig. 1C-b43-010; see also	87Shr, 95Kim
16	Synthesis by sol-gel method: see	91Rav
	Domain observation by transmission electron microscope: see	89Hil

Table 1C-b43-001. (1–x)Pb($Mg_{1/3}Nb_{2/3}$)O_3·x $PbTiO_3$ (ceramics). Dielectric and pyroelectric data together with pyroelectric figures of merit [91Tay].

			Dielectric data				
			E_{bias} = 0		$E_{bias} = E_{b,max}$		
x	$E_{b,max}$ [$\cdot 10^5$ Vm^{-1}]	Temp. direction	Θ_f [°C]	$\kappa(\Theta_f)$	T_m [°C]	$\kappa(T_m)$	tan $\delta(T_m)$
0.10	1.5	cooling	43.2	22733	10	3000	0.0169
	1.5	heating	40.6	23189	10	3000	0.0205
0.07	3.5	cooling	28.4	19719	–1	5850	0.0356
	3.5	heating	26.0	19673	–1	5350	0.0294
0 (with 1% La)	8.0	cooling	–26.1	11207	–50	8500	0.0097
	8.0	heating	–22.0	11352	–50	8600	0.0100

			Pyroelectric data			Figure of merit at T_m		
			$E_{bias} = E_{b,max}$			$E_{bias} = E_{b,max}$		
x	$E_{b,max}$ [$\cdot 10^5$ Vm^{-1}]	Temp. direction	T_d [°C]	$p(T_d)$ [Cm^{-2}K^{-1}]	$p(T_m)$ [Cm^{-2}K^{-1}]	p/κ [μCm^{-2}K^{-1}]	$p/\kappa^{1/2}$ [μCm^{-2}K^{-1}]	$p/\kappa\tan\delta^{1/2}$ [μCm^{-2}K^{-1}]
0.10	1.5	cooling	16.0	0.058	0.0024	0.800	43.8	337.1
	1.5	heating	25.6	0.057	0.0013	0.433	23.7	165.8
0.07	3.5	cooling	6.6	0.0051	0.0028	0.479	36.6	194.0
	3.5	heating	9.4	0.0051	0.0018	0.336	24.6	143.5
0 (with 1% La)	8.0	cooling	–60.0	0.0008	0.0008	0.099	9.1	92.3
	8.0	heating	–58.7	0.0010	0.0010	0.111	10.3	103.0

$E_{b,max}$: maximum DC bias field. T_m: Temperature of measurement.
T_d: Temperature corresponding to p maximum.

Table 1C-b43-002. (1–x)Pb($Mg_{1/3}Nb_{2/3}$)O_3·x $PbTiO_3$. Dielectric and pyroelectric properties of unpoled and poled ceramic specimens [89Cho].

Sample	Unpoled					Poled					
x	κ(RT)	tan δ (RT)	κ_{max}	Θ_f [°C]	tan δ_{max}	κ(RT)	tan δ (RT)	d_{33} [pCN^{-1}]	κ_{max}	Θ_f [°C]	tan δ_{max}
0.225	3533	0.032	29552	112	0.036	1695	0.022	297	28688	114	0.042
0.25	2778	0.031	30192	127	0.061	2435	0.018	305	28714	130	0.070
0.275	2873	0.035	33432	136	0.045	2091	0.030	353	31986	138	0.051
0.3	3782	0.034	36469	139	0.035	4936	0.027	669	33289	143	0.057
0.325	4170	0.029	33350	155	0.029	5260	0.018	663	30048	159	0.049
0.35	3190	0.013	30623	177	0.098	3119	0.006	456	29020	182	0.069
0.375	2434	0.015	28524	190	0.018	2781	0.011	405	28126	198	0.038
0.4	2097	0.016	27156	202	0.030	2371	0.010	323	25189	207	0.044

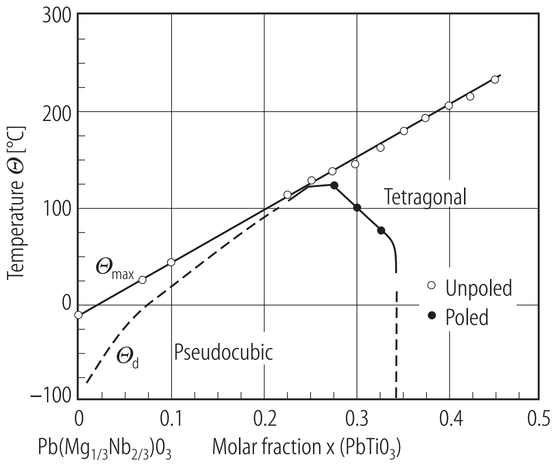

Fig. 1C-b43-001. $(1-x)Pb(Mg_{1/3}Nb_{2/3})O_3 \cdot x\ PbTiO_3$. Θ vs. x [95Zha]. Θ_{max}: temperature corresponding to κ_{max}, Θ_d: depolarization temperature for relaxor ferroelectrics.

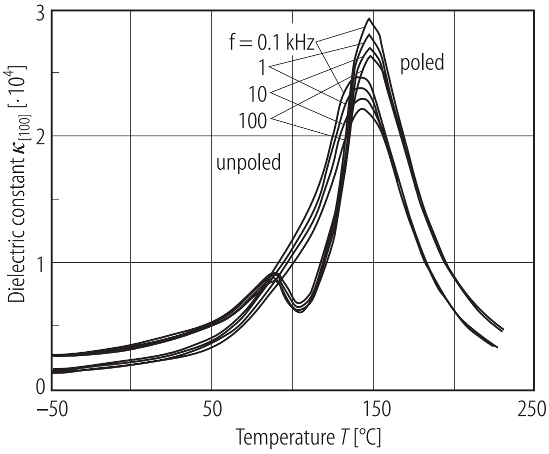

Fig. 1C-b43-002. $Pb[(Mg_{1/3}Nb_{2/3})_{0.7}Ti_{0.3}]O_3$. $\kappa_{[100]}$ vs. T of poled and unpoled crystalline specimens [90Shr]. Parameter: *f*.

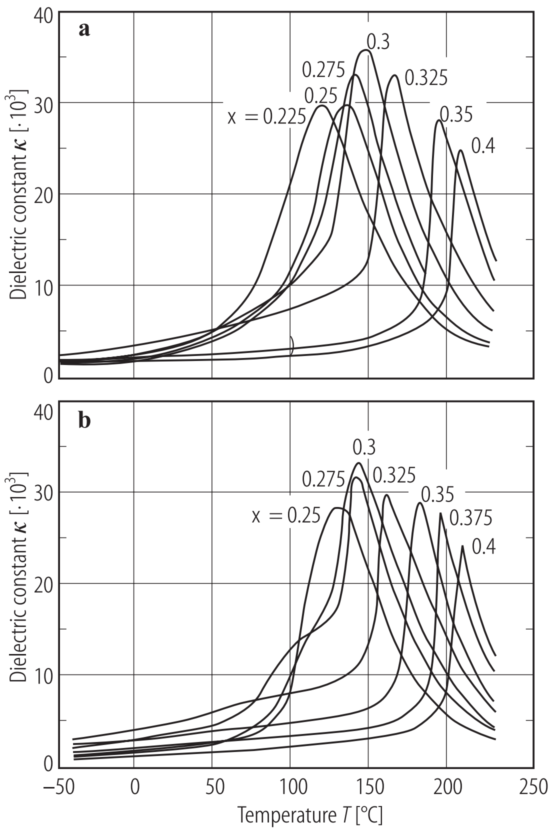

Fig. 1C-b43-003. $(1-x)Pb(Mg_{1/3}Nb_{2/3})O_3 \cdot x$ $PbTiO_3$ (ceramics). κ vs. T [89Cho]. Parameter: x. f = 1 kHz. **(a)** unpoled, **(b)** poled.

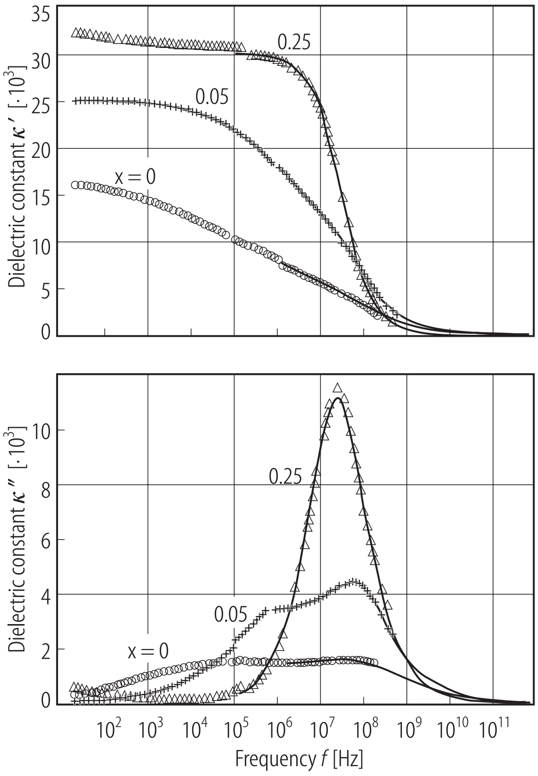

Fig. 1C-b43-004. $(1{-}x)Pb(Mg_{1/3}Nb_{2/3})O_3{\cdot}x$ $PbTiO_3$ (ceramics). κ', κ'' vs. f [94Eli2]. Parameter: x. $T = T_m$ (temperature corresponding to κ'_{max}). Full line: calculated.

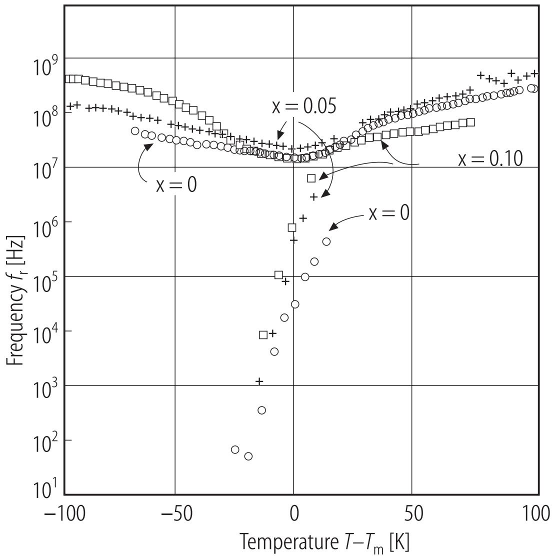

Fig. 1C-b43-005. $(1–x)Pb(Mg_{1/3}Nb_{2/3})O_3 \cdot x\ PbTiO_3$ (ceramics). f_r vs. $T - T_m$ [94Eli2]. Parameter: x. f_r: dielectric relaxation frequency, T_m: temperature corresponding to κ'_{max} .

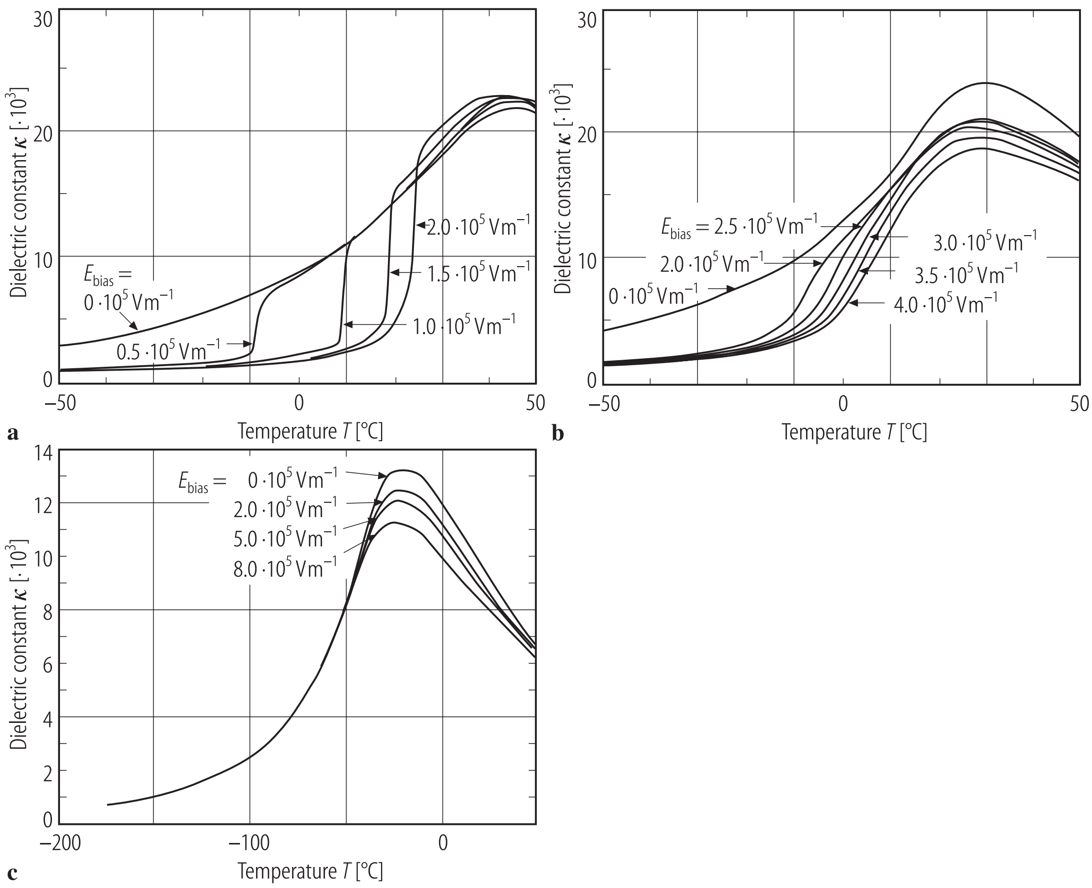

Fig. 1C-b43-006. $(1-x)Pb(Mg_{1/3}Nb_{2/3})O_3 \cdot x\,PbTiO_3$ (ceramics). κ vs. T [91Tay]. Parameter: E_{bias}. On cooling cycle. **(a)**: x = 0.10, **(b)**: x = 0.07, **(c)**: x = 0 with 1 mol % La.

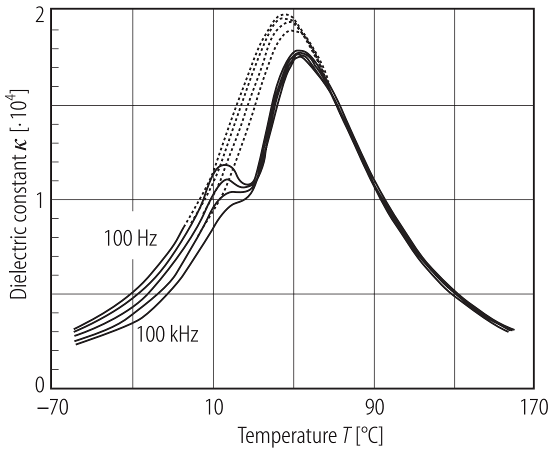

Fig. 1C-b43-007. $Pb[(Mg_{1/3}Nb_{2/3})_{0.9}Ti_{0.1}]O_3$ (ceramics doped with 0.1 mol % MnO). *κ* vs. *T* [86Pan]. Solid curves: aged at 23 °C for 1000 h, dotted curves: freshly de-aged at 160 °C for 0.5 h. Parameter: *f* (100 Hz, 1 kHz, 10 kHz and 100 kHz from the upper in order).

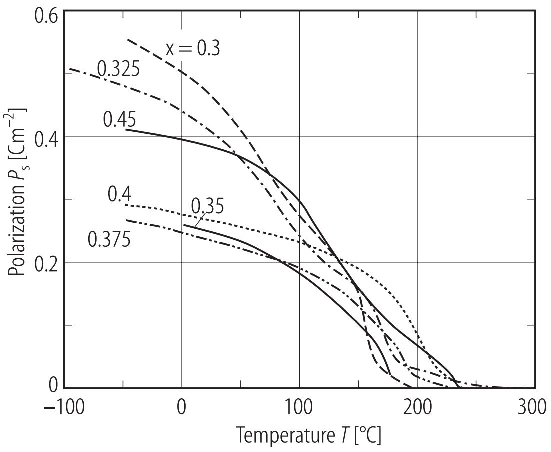

Fig. 1C-b43-008. (1−x)$Pb(Mg_{1/3}Nb_{2/3})O_3$·x $PbTiO_3$ (ceramics). P_s vs. T [89Cho]. Parameter: x.

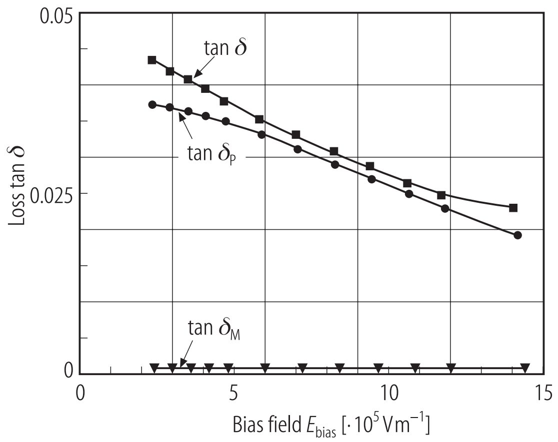

Fig. 1C-b43-009. $Pb[(Mg_{1/3}Nb_{2/3})_{0.93}Ti_{0.07}]O_3$ (ceramics doped with 1 % La). $\tan\delta$, $\tan\delta_P$, $\tan\delta_M$ vs. E_{bias} [90Tay]. $\tan\delta$: dielectric loss tangent, $\tan\delta_P$: piezoelectric loss tangent (d''_{31} / d'_{31}), $\tan\delta_M$: mechanical loss tangent (s''_{11} / s'_{11}).

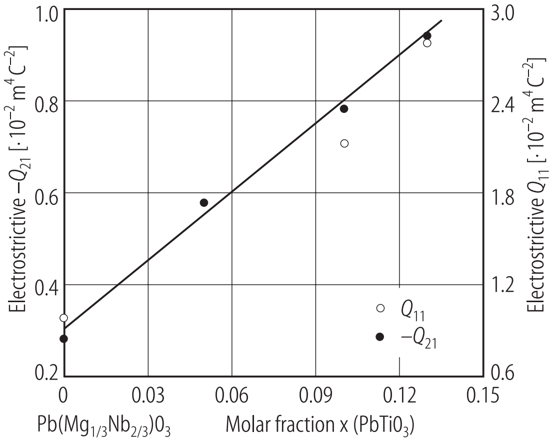

Fig. 1C-b43-010. (1–x)Pb($Mg_{1/3}Nb_{2/3}$)O_3·x $PbTiO_3$ (ceramics). Q_{11}, $-Q_{21}$ vs. x [80Jan]. $Q_{\lambda 1}$: electrostrictive constant.

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