

REFERENCES

- [1] G.H. Haertling, "Ferroelectric ceramics: history and technology," *J. Am. Ceram. Soc.*, 82, 797-818, 1999.
- [2] J.F. Scott, "New developments on FRAMs: [3D] structures and all-perovskite FETs," *Mater. Sci. Eng. B.*, 120, 6-12, 2005.
- [3] S.D. Bu, B.S. Kang, B.H. Park and T.W. Noh, "Composition dependence of the ferroelectric properties of lanthanum-modified bismuth titanate thin films grown by using pulsed-laser deposition," *J. Korean. Phys. Soc.*, 36, L9-L12, 2000.
- [4] J.S. Kim, S.S. Kim and T.K. Song, "Ferroelectric properties of bismuth lanthanum titanate (BLT) thin films processed at low temperature," *J. Korean. Phys. Soc.*, 43, 548-552, 2003.
- [5] J.C. Bae, S. Kim, E.K. Choi, T.K. Song, W-J. Kim and Y-I. Lee, "Ferroelectric properties of lanthanum-doped bismuth titanate thin films grown by a sol-gel method," *Thin Solid Films*, 472, 90-95, 2005.
- [6] S.E. Cummins and L.E. Cross, "Electrical and optical properties of ferroelectric $\text{Bi}_4\text{Ti}_3\text{O}_{12}$ single crystals," *J. Appl. Phys.*, 9, 2268-2274, 1968.
- [7] Q-Y. Tang, Y-M. Kan, Y-G. Li, G-J. Zhang and P-L. Wang, "Effect of vanadium doping on fabrication and property of $\text{Bi}_4\text{Ti}_3\text{O}_{12}$ ceramics," *Scripta Mater.*, 54, 2075-2080, 2006.

- [8] A.Z. Simoes, A.H.M. Gonzalez, C.S. Riccardi, E.C. Souza, F. Moura, M.A. Azghe, E. Longo and J.A. Varela, "Ferroelectric and dielectric properties of lanthanum-modified bismuth titanate thin films obtained by the polymeric precursor method," *J. Electroceram.*, 13, 65-70, 2004.
- [9] K-T. Kim and C-I. Kim, "Effect of lanthanides-substituted on ferroelectric properties of bismuth titanate thin films prepared by metalorganic decomposition," *Mater. Sci. Eng. B.*, 118, 229-233, 2005.
- [10] C. Cheng, M. Tang, Z. Ye, Y. Zhou, X. Zheng, Z. Hu and H. Hu, "Microstructure and ferroelectric properties of dysprosium-doped bismuth titanate thin films," *Mater. Lett.*, 61, 4117-4120, 2007.
- [11] U. Chon, K-B. Kim, H.M. Jang and G-C. Yi, "Fatigue-free samarium modified bismuth titanate ($\text{Bi}_{4-x}\text{Sm}_x\text{Ti}_3\text{O}_{12}$) film capacitors having large spontaneous polarizations," *Appl. Phys. Lett.*, 79, 3137-3139, 2001.
- [12] H. Maiwa, N. Liazwa, D. Togawa and T. Hayashi, "Electromechanical properties of Nd-doped $\text{Bi}_4\text{Ti}_3\text{O}_{12}$ films: A candidate for lead-free thin-film piezoelectrics," *Appl. Phys. Lett.*, 82, 1760-1762, 2003.
- [13] U. Chon, J.S. Shim and H.M. Jang, "Ferroelectric properties and crystal structure of praseodymium-modified bismuth titanate," *J. Appl. Phys.*, 93, 4769-4775, 2003.
- [14] J.K. Kim, J. Kim, T.K. Song and S.S. Kim., "Effects of niobium doping on microstructures and ferroelectric properties of bismuth titanate ferroelectric thin films," *Thin Solid Films*, 419, 225-229, 2002.

- [15] J.S. Kim, S.S. Kim and J.K. Kim, "Ferroelectric Properties of Nb-Doped $\text{Bi}_4\text{Ti}_3\text{O}_{12}$ Thin Films Prepared Using Surfactant in Acid or Basic Atmosphere," *Jpn. J. Appl. Phys.*, 42, 6486-6490, 2003.
- [16] L. Zhang, R. Chu, S. Zhao, G. Li and Q. Yin, "Microstructure and electrical properties of niobium doped $\text{Bi}_4\text{Ti}_3\text{O}_{12}$ layer-structured piezoelectric ceramics," *Mater. Sci. Eng. B.*, 116, 99-103, 2005.
- [17] Z.H. Bao, Y.Y. Yao, J.S. Zhu and Y.N. Wang, "Study on ferroelectric and dielectric properties of niobium doped $\text{Bi}_4\text{Ti}_3\text{O}_{12}$ ceramics and thin films prepared by PLD method," *Mater. Lett.*, 56, 861-866, 2002.
- [18] A.R. Chaudhuri, A. Laha and S.B. Krupanidhi, "Enhanced ferroelectric properties of vanadium doped bismuth titanate (BTV) thin films grown by pulsed laser ablation technique," *Solid. State. Commun.*, 133, 611-614, 2005.
- [19] J.K. Kim, T.K. Song, S.S. Kim and J. Kim, "Ferroelectric properties of tungsten doped bismuth titanate thin film prepared by sol-gel route," *Mater. Lett.*, 57, 964-968, 2002.
- [20] A. Yokoi and H. Ogawa, "Crystal structure and ferroelectric properties of mixed bismuth layer-structured $\text{Bi}_7\text{Ti}_{4+x/2}\text{Nb}_{1-x}\text{W}_{x/2}\text{O}_{21}$ ceramics," *Mater. Sci. Eng. B.*, 129, 80-85, 2006.
- [21] Y. Wu and G. Cao, "Ferroelectric and dielectric properties of strontium bismuth niobate vanadates," *J. Mater. Res.*, 15, 1583-1590, 2000.
- [22] J.S. Kim, C.W. Ahn, H.J. Lee, I.W. Kim and B.M. Jin, "Nb doping effects on ferroelectric and electrical properties of ferroelectric $\text{Bi}_{3.25}\text{La}_{0.75}(\text{Ti}_{1-x}\text{Nb}_x)_3\text{O}_{12}$ ceramics," *Ceram. Int.*, 30, 1459-1462, 2004.

- [23] D. Bao, N. Wakiya, K. Shinozaki and N. Mizutani, "Ferroelectric properties of sandwich structured $(\text{Bi},\text{La})_4\text{Ti}_3\text{O}_{12}/\text{Pb}(\text{Zr},\text{Ti})\text{O}_3/(\text{Bi},\text{La})_4\text{Ti}_3\text{O}_{12}$ thin films on Pt/Ti/SiO₂/Si substrates," *J. Phys. D: Appl. Phys.*, 35, L1-L5, 2002.
- [24] D. Bao, S.K. Lee, X. Zhu, M. Alexe and D. Hesse, "Growth, structure, and properties of all-epitaxial ferroelectric $\text{Bi},\text{La}_4\text{Ti}_3\text{O}_{12}/\text{PbZr}_{0.4}\text{Ti}_{0.6}\text{O}_3/\text{Bi},\text{La}_4\text{Ti}_3\text{O}_{12}$ trilayered thin films on SrRuO₃-covered SrTiO₃(011) substrates," *Appl. Phys. Lett.*, 86, 082906(1)-(3), 2005.
- [25] N. Thongmee, A. Watcharapasorn and S. Jiansirisomboon, "Structure-property relations of ferroelectric $\text{Pb}(\text{Zr}_{0.52}\text{Ti}_{0.48})\text{O}_3-(\text{Bi}_{3.25}\text{La}_{0.75})\text{Ti}_3\text{O}_{12}$ composite ceramics," *Curr. Appl. Phys.*, 8, 367-371, 2008.
- [26] N. Thongmee, A. Watcharapasorn and S. Jiansirisomboon, "Synthesis, phase and microstructure characteristics of $\text{Pb}(\text{Zr}_{0.52}\text{Ti}_{0.48})\text{O}_3-(\text{Bi}_{3.25}\text{La}_{0.75})\text{Ti}_3\text{O}_{12}$ ceramics," *Curr. Appl. Phys.*, 7, 671-674, 2007.
- [27] B. Jaffe, W.R. Cook and H. Jaffe, "Piezoelectric Ceramics," New York: Academic Press, 1971.
- [28] J. Valasek, "Piezo-Electric and Allied Phenomena in Rochelle Salt," *Phys. Rev.*, 17, 475-481, 1921.
- [29] Y. Xu, "Ferroelectric Materials and Their Applications," Amsterdam: North Holland Elsevier Sci. Publ., 1991.
- [30] R. Landauer, "Electrostatic considerations in BaTiO₃ domain formation during polarization reversal," 28, 227-234, 1957.
- [31] M.E. Lines and A.M. Glass, "Principles and Applications of Ferroelectrics and Related Materials," Oxford: Clarendon Press, 1977.

- [32] A.J. Moulson and J.M. Herbert, "Electroceramics," New York: Chapman and Hall Press, 1996.
- [33] K.M. Rabe, C.H. Ahn and J-M.Triscone, "Physics of ferroelectrics," Heidelberg: Springer, 2007.
- [34] C.B. Sawyer and C.H. Tower, "Rochelle Salt as a Dielectric," *Phys. Rev.*, 35, 269-273, 1930.
- [35] F. Jona and G. Shirane, "Ferroelectric Crystals," Oxford: Pergamon Press, 1995.
- [36] S. Yang, H. Bao, C. Zhou, Y. Wang, X. Ren, Y. Matsushita and Y. Katsuya, "Large magnetostriction from morphotropic phase boundary in ferromagnets," *Phys. Rev. Lett.*, 104, 197201(1)-(4), 2010.
- [37] L.E. Cross, "Ferroelectric materials for electromechanical transducer applications," *Jpn. J. Appl. Phys.*, 34, 2525-2532, 1995.
- [38] B. Aurivillius, "Mixed bismuth oxide with layer lattices, I. The structure type of $\text{CaNb}_2\text{Bi}_2\text{O}_9$," *Arkiv Kemi*, 1, 463-480, 1949.
- [39] B. Aurivillius, "Mixed bismuth oxide with layer lattices, II. Structure of $\text{Bi}_4\text{Ti}_3\text{O}_{12}$," *Arkiv Kemi*, 1, 499-512, 1949.
- [40] B. Aurivillius, "Mixed bismuth oxide with layer lattices, III. Structure of $\text{BaBi}_4\text{Ti}_4\text{O}_{12}$," *Arkiv Kemi*, 2, 519-527, 1950.
- [41] R.A. Armstrong and R.E. Newnham, "Bismuth titanate solid solutions," *Mat. Res. Bull.*, 7, 1025-1034, 1972.
- [42] T. Kikuchi, A. Watanabe and K.Uchida, "A family of mixed-layer type bismuth compounds," *Mat. Res. Bull.*, 12, 299-304, 1977.

- [43] R.E. Newnham, R.W. Wolfe and J.F. Dorrian, "Structural basis of ferroelectricity in the bismuth titanate family," *Mat. Res. Bull.*, 6, 1029-1040, 1971.
- [44] B.H. Park, S.J. Hyun, S.D. Bu, T.W. Noh, J. Lee, H-D. Kim, T.H. Kim and W. Jo, "Difference in nature of defects between SrBi₂Ta₂O₉ and Bi₄Ti₃O₁₂," *Appl. Phys. Lett.*, 74, 1907-1909, 1999.
- [45] I. Coondoo, A.K. Jha and S.K. Agarwal, "Enhancement of dielectrics in donor doped Aurivillius SrBi₂Ta₂O₉ ferroelectric ceramics," *J. Eur. Ceram. Soc.*, 27, 253-260, 2007.
- [46] K. Shoji, K. Shibata, T. Nakayama and K. Sakata, "Preparation and properties of SrBi₂Ta₂O₉ ceramics II," *Jpn. J. Appl. Phys.*, 39, 5569-5572, 2000.
- [47] V. Srivastava, A.K. Jha and R.G. Mendiratta, "Electrical investigations of aurivillius type Sr_{0.7}A_{0.3}Bi₂Nb₂O₉ (A = Ca, La, Pb) ferroelectric ceramics," *Ferroelectrics*, 356, 54-61, 2007.
- [48] J.F. Scott and C.A.P. Dearanzo, "Ferroelectric memories," *Science*, 246, 1400-1405, 1989.
- [49] Y. Shimakawa, Y. Kubo, Y. Tauchi, H. Asano, T. Kamiyama, F. Izumi and Z. Hiroi, "Crystal and electronic structures of Bi_{4-x}La_xTi₃O₁₂ ferroelectric materials," *Appl. Phys. Lett.*, 79, 2791-2793, 2001.
- [50] B.H. Park, B.S. Kang, S.D. Bu, T.W. Noh, L. Lee and W. Joe, "Lanthanum-substituted bismuth titanate for use in non-volatile memories," *Nature*, 401, 682-684, 1999.

- [51] P.C. Joshi and S.B. Krupanidhi, "Switching, fatigue, and retention in ferroelectric $\text{Bi}_4\text{Ti}_3\text{O}_{12}$ thin films," *Appl. Phys. Lett.*, 62, 1928-1930, 2001.
- [52] Y.Y. Yao, C.H. Song, P. Bao, D. Su, X.M. Lu, J.S. Zhu and Y.N. Wang, "Doping effect on the dielectric property in bismuth titanate," *J. Appl. Phys.*, 95, 3126-3130, 2004.
- [53] S.S. Kim, J.S. Song and S.C. Kwon, "Ferroelectric $(\text{Bi},\text{Dy})_4\text{Ti}_3\text{O}_{12}$ thin films deposited on Pt (111)/Ti/SiO₂/Si and p-type Si (100) substrates," *J. Cryst. Growth.*, 271, 90-98, 2004.
- [54] U. Chon, G.C. Yi and H.M. Jang, "Fatigue-free behavior of highly oriented $\text{Bi}_{3.25}\text{La}_{0.75}\text{Ti}_3\text{O}_{12}$ thin films grown on Pt/Ti/SiO₂/Si(100) by metalorganic solution decomposition," *Appl. Phys. Lett.*, 78, 658-660, 2001.
- [55] M.C. Kao, H.Z. Chen, S.L. Young, C.C. Yu, C.H. Lin, C.C. Lin and C.M. Lee, "Effect of dysprosium substitution on the properties of bismuth titanate thin films prepared by sol-gel method," *Ferroelectrics*, 382, 182-186, 2009.
- [56] S.Y. Lee and B-O.Park, "Microstructure and ferroelectric properties of Nb-doped $\text{Bi}_4\text{Ti}_3\text{O}_{12}$ thin films prepared by sol-gel method," *J. Cryst. Growth.*, 283, 81-86, 2005.
- [57] N. Thongmee, A. Watcharapasorn and S. Jiansirisomboon, "Dielectric properties of complex structured $(1-x)\text{Pb}(\text{Zr}_{0.52}\text{Ti}_{0.48})\text{O}_{3-x}(\text{Bi}_{3.25}\text{La}_{0.75})\text{Ti}_3\text{O}_{12}$ ceramics," *Ferroelectrics*, 384, 10-16, 2009.

- [58] D. Damjanovic, "Ferroelectric, dielectric and piezoelectric properties of ferroelectric thin films and ceramics," *Rep. Prog. Phys.*, 61, 1267-1324, 1998.
- [59] M. Ozgul, "Polarization switching and fatigue anisotropy in relaxor-lead titanate ferroelectric single crystals." Ph.D.: The Pennsylvania State University, 2003.
- [60] X.J. Lou, "Polarization fatigue in ferroelectric thin films and related materials," *J. Appl. Phys.*, 105, 024101(1)-(24), 2009.
- [61] A.I. Kingon and S.K. Streiffer, "Ferroelectric films and devices," *Curr. Opin. Sol. St. M.*, 4, 39-44, 1999.
- [62] H.L. Stadler, "Ferroelectric switching time of BaTiO₃ crystals at high voltages," *J. Appl. Phys.*, 29, 1485-1487, 1958.
- [63] D.B. Fraser and J.R. Maldonado, "Improved aging and switching of lead-zirconate-lead titanate ceramics with indium electrodes," *J. Appl. Phys.*, 41, 2172-2176, 1970.
- [64] S.B. Desu, "Minimization of fatigue in ferroelectric films," *Phys. Stat. Sol. (A)*, 151, 467-480, 1995.
- [65] W.C. Stewart and L.S. Cosentino, "Some optical and electrical switching characteristics of a lead zirconate titanate ferroelectric ceramic," *Ferroelectrics*, 1, 149-167, 1970.
- [66] R. Williams, "Surface layer and decay of the switching properties of barium titanate," *J. Phys. Chem. Solids.*, 26, 399-405, 1965.

- [67] E. Paton, M. Brazier, S. Mansour and A. Bement, "A critical study of defect migration and ferroelectric fatigue in lead zirconate titanate thin film capacitors under extreme temperatures," *Integr. Ferroelectr.*, 18, 29-37, 1997.
- [68] C.J. Brennan, R.D. Parrella and D.E. Larsen, "Temperature dependence fatigue rates in thin-film ferroelectric capacitors," *Ferroelectrics*, 151, 33-38, 1994.
- [69] G.L. Yuan, J-M. Liu, Y.P. Wang, D. Wu, S.T. Zhang, Q.Y. Shao and Z.G. Liu, "Temperature-dependent fatigue behaviors of ferroelectric ABO_3 -type and layered perovskite oxide thin films," *Appl. Phys. Lett.*, 84, 3352-3354, 2004.
- [70] K. Lee, B.R. Rhee and C. Lee, "Characteristics of ferroelectric $\text{Pb}(\text{Zr}, \text{Ti})\text{O}_3$ thin films having Pt/PtO_x electrode barriers," *Appl. Phys. Lett.*, 79, 821-823, 2001.
- [71] R. Ramesh, W.K. Chan, B. Wilkens, T. Sands, J.M. Tarascon, V.G. Keramidas, D.K. Fork, J. Lee and A. Safari, "Fatigue and aging in ferroelectric $\text{PbZr}_{0.2}\text{Ti}_{0.8}\text{O}_3/\text{YBa}_2\text{Cu}_3\text{O}_7$ heterostructures," *Integr. Ferroelectr.*, 1, 1-15, 1992.
- [72] S.B. Majumder, Y.N. Mohapatra and D.C. Agrawal, "Fatigue resistance in lead zirconate titanate thin ferroelectric films: Effect of cerium doping and frequency dependence," *Appl. Phys. Lett.*, 70, 138-140, 1997.
- [73] R.D. Klissurska, K.G. Brooks and N. Setter, "Effects of dopants on the crystallization mechanism of PZT thin films," *Ferroelectrics*, 225, 327-334, 1999.

- [74] Q. Zhang and R.W. Whatmore, "Improved ferroelectric and pyroelectric properties in Mn-doped lead zirconate titanate thin films," *J. Appl. Phys.*, 94, 5228-5233, 2003.
- [75] Q. Zhang and R.W. Whatmore, "Low fatigue lead zirconate titanate-based capacitors modified by manganese for nonvolatile memories," *Mater. Sci. Eng. B.*, 109, 136-140, 2004.
- [76] C.B. Eom, R.B. Vandover, J.M. Phillips, D.J. Werder, J.H. Marshall, C.H. Chen, R.J. Cava, R.M. Fleming and D.K. Fork, "Fabrication and properties of epitaxial ferroelectric heterostructures with (SrRuO_3) isotropic metallic oxide electrodes," *Appl. Phys. Lett.*, 63, 2570-2572, 1993.
- [77] R. Ramesh, W.K. Chan, B. Wilkens, H. Gilchrist, T. Sands, J.M. Tarascon, V.G. Keramidas, D.K. Fork, J. Lee and A. Safari, "Fatigue and retention in ferroelectric Y-Ba-Cu-O/Pb-Zr-Ti-O/Y-Ba-Cu-O heterostructures," *Appl. Phys. Lett.*, 61, 1537-1539, 1992.
- [78] R. Ramesh, J. Lee, T. Sands, V.G. Keramidas and O. Auciello, "Oriented ferroelectric La-Sr-Co-O/Pb-La-Zr-Ti-O/La-Sr-Co-O heterostructures on [001] Pt/SiO₂ Si substrates using a bismuth titanate template layer," *Appl. Phys. Lett.*, 64, 2511-2513, 1994.
- [79] B.G. Chae, C.H. Park, Y.S. Yang and M.S. Jang, "Asymmetry in fatigue and recovery in ferroelectric Pb(Zr,Ti)O₃ thin-film capacitors," *Appl. Phys. Lett.*, 75, 2135-2137, 1999.

- [80] M. Grossmann, D. Bolten, O. Lohse, U. Boettger, R. Waser and S. Tiedke, "Correlation between switching and fatigue in $\text{PbZr}_{0.3}\text{Ti}_{0.7}\text{O}_3$ thin films," *Appl. Phys. Lett.*, 77, 1894-1896, 2000.
- [81] P.J. Schorn, D. Brauhaus, U. Bottger, R. Waser, G. Beitel, N. Nagel and R. Bruchhaus, "Fatigue effect in ferroelectric $\text{PbZr}_{1-x}\text{Ti}_x\text{O}_3$ thin films," *J. Appl. Phys.*, 99, 114104(1)-(5), 2006.
- [82] C.Z. Pawlaczek, A.K. Tagantsev, K. Brooks, I.M. Reanev, R. Klissurska and N. Setter, "Fatigue, rejuvenation and self-restoring in ferroelectric thin films," *Integr. Ferroelectr.*, 9, 293-316, 1995.
- [83] P.K. Larsen, G.J.M. Dormans, D.J. Taylor and P.J. Vanveldhoven, "Ferroelectric properties and fatigue of $\text{PbZr}_{0.51}\text{Ti}_{0.49}\text{O}_3$ thin films of varying thickness: Blocking layer model," *J. Appl. Phys.*, 76, 2405-2413, 1994.
- [84] Q.Y. Jiang, E.C. Subbarao and L.E. Cross, "Effect of composition and temperature on electric fatigue of La-doped lead zirconate titanate ceramics," *J. Appl. Phys.*, 75, 7433-7443, 1994.
- [85] C.K. Barlingay and S.K. Dey, "Dopant compensation mechanism and leakage current in $\text{Pb}(\text{Zr}_{0.52},\text{Ti}_{0.48})\text{O}_3$ thin films," *Thin Solid Films*, 272, 112-115, 1996.
- [86] M. Pereira, A.G. Peixoto and M.J.M. Gomes, "Effect of Nb doping on the microstructural and electrical properties of the PZT ceramics," *J. Euro. Ceram. Soc.*, 21, 1353-1356, 2001.

- [87] H.N. Al-shareef, O. Auciello and A. Kingon, "Electrical properties of ferroelectric thin-film capacitors with hybrid (Pt, RuO₂) electrodes for nonvolatile memory applications," *J. Appl. Phys.*, 77, 2146-2154, 1995.
- [88] H.M. Duiker, P.D. Beale, J.F. Scott, C.A.P. Araujo, B.M. Melnick, J.D. Cuchiaro and L.D. McMillan, "Fatigue and switching in ferroelectric memories: Theory and experiment," *J. Appl. Phys.*, 68, 5783-5791, 1990.
- [89] I.K. Yoo and S.B. Desu, "Mechanism of fatigue in ferroelectric thin films," *Phys. Status. Solidi. A*, 133, 565-573, 1992.
- [90] J.F. Scott, C.A. Araujo, B.M. Melnick, L.D. McMillan and R. Zuleeg, "Quantitative measurement of space-charge effects in lead zirconate-titanate memories," *J. Appl. Phys.*, 70, 382-388, 1991.
- [91] H.N. Al-shareef, D. Dimos, W.L. Warren and B.A. Tuttle, "A model for optical and electrical polarization fatigue in SrBi₂Ta₂O₉ and Pb(Zr, Ti)O₃," *Integr. Ferroelectr.*, 15, 1-4, 1997.
- [92] E.L. Colla, D.V. Taylor, A.K. Tagantsev and N. Setter, "Discrimination between bulk and interface scenarios for the suppression of the switchable polarization (fatigue) in Pb(Zr, Ti)O₃ thin films capacitors with Pt electrodes," *Appl. Phys. Lett.*, 72, 2478-2480, 1998.
- [93] E.L. Colla, A.K. Tagantsev, D. Taylor and A.L. Khoklin, "Field-adjusted suppression of the switching polarization in ferroelectric PZT thin films with Pt-electrodes," *J. Korean. Phys. Soc.*, 32, S1353-S1356, 1998.
- [94] D.J. Johnson, D.T. Amm, E. Griswold, K. Sreenivas, G. Yi and M. Sayer, "Measuring fatigue in PZT thin films," *Mater. Res. Soc. Symp. Proc.*, 200, 289-295, 1990.

- [95] T. Mihara, H. Watanabe and C.A.P. Araujo, "Characteristic change due to polarization fatigue of sol-gel ferroelectric Pb(Zr_{0.4}Ti_{0.6})O₃ thin-film capacitors," *Jpn. J. Appl. Phys.*, 33, 5281-5286, 1994.
- [96] W.L. Warren, D. Dimos, B.A. Tuttle, G.E. Pike, R.W. Schwartz, P.J. Clews and D.C. McIntyre, "Polarization suppression in Pb(Zr, Ti)O₃ thin films," *J. Appl. Phys.*, 77, 6695-6702, 1995.
- [97] W.L. Warren, B.A. Tuttle and D. Dimos, "Ferroelectric fatigue in perovskite oxides," *Appl. Phys. Lett.*, 67, 1426-1428, 1995.
- [98] M.D. Michael, S.W. Grady and C-S. Hwang, "Cyclic damage in lead zirconate titanate," *J. Am. Ceram. Soc.*, 79, 1915-1920, 1996.
- [99] E. Fatuzz and W.J. Merg, "Ferroelectricity" New York: North-Holland, 1967.
- [100] J. Nuffer, D.C. Lupascu and J. Rodel, "Damage evolution in ferroelectric PZT induced by bipolar electric cycling," *Acta. Mater.*, 48, 3783-3794, 2000.
- [101] R. Waser, U. Bottger and S. Tiedke, "Polar oxides; properties, characterization and imaging," Weinheim: Wiley-VchVerlat GmbH & Co., 2005.
- [102] The Inorganic Crystal Structure database (ICSD) code. 92059.
- [103] The Inorganic Crystal Structure database (ICSD) code. 97060.
- [104] C.A. Randll, N. Kim, J.P. Kucera, W. Cao and T.R. Shroud, "Intrinsic and extrinsic size effects in fine-grained morphotropic-phase-boundary lead zirconate titanate ceramics," *J. Am. Ceram. Soc.*, 81, 677-688, 1998.
- [105] J.C. Fernandes, D.A. Hall, M.R. Cockburn and G.N. Greaves, "Phase coexistence in PZT ceramic powders," *Nucl. Instrum. Meth. B*, 97, 137-141, 1995.
- [106] The Inorganic Crystal Structure database (ICSD) code.87810.

- [107] S. Fushimi and T. Ikeda, "Phase equilibrium in the system PbO-TiO₂-ZrO₂," *J. Am. Ceram. Soc.*, 50, 129-132, 1967.
- [108] E.M. Levin and C.L. McDaniel, "The system Bi₂O₃-B₂O₃," *J. Am. Ceram. Soc.*, 45, 355-360, 1962.
- [109] R.D. Shannon, "Revised effective ionic radii and systematic studies of interatomic distances in halides and chalogenides," *Acta. Crystallogr. A*, 32, 751-767, 1976.
- [110] The Inorganic Crystal Structure database (ICSD) code.150403
- [111] J.S. Yang, X.M. Chen, T. Aizawa and M. Kuwabara, "PZT based piezoelectric ceramics with enhanced fracture toughness," *Solid. State.Ionics.*, 108, 117-121, 1998.
- [112] M. Ausloos, "Dielectric response of composite materials," *J. Phys. C: Solid State Phys.*, 18, L1163-L1167, 1985.
- [113] Y. Wu, C. Nguyen, S. Seraji, M.J. Forbess, J. Limmer, T. Chou and G. Cao, "Processing and properties of strontium bismuth vanadate niobate ferroelectric ceramics," *J. Am. Ceram. Soc.*, 84, 2882-2888, 2001.
- [114] I. Coondoo, A.K. Jha and S.K. Agarwal, "Structural, dielectric and electrical studies in tungsten doped SrBi₂Ta₂O₉ ferroelectric ceramics," *Ceram. Int.*, 33, 41-47, 2007.
- [115] A. Fouskova and L.E. Cross, "Dielectric properties of bismuth titanate," *J. Appl. Phys.*, 41, 2834-2838, 1970.
- [116] M. Villegas, T. Jardiel, A.C. Caballero and J.F. Fernandez, "Electrical properties of bismuth titanate based ceramics with secondary phases," *J. Electroceram.*, 13, 543-548, 2004.

- [117] H.S. Shulman, M. Testorf, D. Damjanovic and N. Setter, "Microstructure, electrical conductivity and piezoelectric properties of bismuth titanate," *J. Am. Ceram. Soc.*, 79, 3124-3128, 1996.
- [118] G.H. Haertling and W.J. Zimmer, "Analysis of hot-pressing parameters for lead zirconate-lead titanate ceramics containing two atom percent bismuth," *Am. Ceram. Soc. Bull.*, 45, 1084-1089, 1966.
- [119] B.M. Jin, J. Kim and S.C. Kim, "Effects of grain size on the electrical properties of $\text{PbZr}_{0.52}\text{Ti}_{0.48}\text{O}_3$ ceramics," *Appl. Phys. A*, 65, 53-56, 1997.
- [120] S. Sharma, R. Singh, T.C. Goel and S. Chandra, "Synthesis, structural and electrical properties of La modified PZT system," *Compos. Mater. Sci.*, 37, 86-89, 2006.
- [121] A.I. Burkhanov, A.V. Shilnikov, A.V. Sopit and A.G. Luchaninov, "Dielectric and electromechanical properties of $(1-x)\text{PMN}-x\text{PZT}$ ferroelectric ceramics," *Phys. Solid. State.*, 42, 936-943, 2000.
- [122] Z. Ye, M.H. Tang, C.P. Cheng, Y.C. Zhou, X.J. Zheng and Z. Su, "Simulation of polarization and butterfly hysteresis loops in bismuth layer-structured ferroelectric thin films," *J. Appl. Phys.*, 100, 094101(1)-(5), 2006.
- [123] S.R. Panteny, C.R. Bowen and R. Stevens, "Piezoelectric particulate reinforced nanocomposites," Oxford: The Alden Group, 2000.
- [124] K. Tajima, H.J. Hwang, M. Sando and K. Niihara, "PZT nanocomposites reinforced by small amount of oxides," *J. Eur. Ceram. Soc.*, 19, 1179-1182, 1999.

- [125] W.L. Warren, D. Dimos, B.A. Tuttle, R.D. Nasby and G.E.Pike, "Electronic domain pinning in Pb(Zr, Ti)O₃ thin films and its role in fatigue," *Appl. Phys. Lett.*, 65, 1018-1020, 1994.
- [126] I.K. Yoo and S.B. Desu, "Fatigue modeling of lead zirconate titanate thin films," *Mater. Sci. Eng. B.*, 13, 319-322, 1992.
- [127] Y. Ding, J.S. Liu, I. Maclarens and Y.N. Wang, "Ferroelectric switching mechanism in SrBi₂Ta₂O₉," *Appl. Phys. Lett.*, 79, 1015-1017, 2001.
- [128] S.T. Zhang, C.S. Xiao, A.A. Fang, B. Yang, B. Sun, Y.F. Chen, Z.G. Liu and N.B. Ming, "Ferroelectric properties of Sr₂Bi₄Ti₅O₁₈ thin films," *Appl. Phys. Lett.*, 76, 3112-3114, 2000.
- [129] H.N. Al-shareef, B.A. Tuttle, W.L. Warren, T.J. Headley, D. Dimos, J.A. Voigt and R.D. Nasby, "Effect of B-site cation stoichiometry on electrical fatigue of RuO₂//Pb(Zr_xTi_{1-x})O₃//RuO₂ capacitors," *J. Appl. Phys.*, 79, 1013-1016, 1996.
- [130] C.A.P. Araujo, J.D. Cuchiaro, L.D. McMillan, M.C. Scott and J.F. Scott, "Fatigue-free ferroelectric capacitors with platinum electrodes," *Nature*, 374, 627-629, 1995.
- [131] C.P. Cheng, M.H. Tang, J.Y. Yang and Y.H. Deng, "Ferroelectric properties of Bi_{3.4}Dy_{0.6}Ti₃O₁₂ thin films crystallized in N₂," *Mater. Lett.*, 62, 2450-2453, 2008.
- [132] H.N. Al-shareef, D. Dimos, T.J. Boyle, W.L. Warren and B.A. Tuttle, "Qualitative model for the fatigue-free behavior of SrBi₂Ta₂O₉," *Appl. Phys. Lett.*, 68, 690-692, 1996.

- [133] H.S. Lee and K.B. Lee, "Ferroelectric properties and polarization fatigue of Bi-modified Pb(Zr, Ti)O₃ thin film," *J. Phys. IV France*, 8, Pr9-209-Pr9-212, 1998.
- [134] W-Y. Choi, J-H. Ahn, W-J. Lee and H-G. Kim, "Electrical properties of Sb-doped PZT films deposited by d.c. reactive sputtering using multi-targets," *Mater. Lett.*, 37, 119-127, 1998.
- [135] Z. Zhang, L. Lu, C. Shu, P. Wu and W. Song, "Ferroelectrical properties of W-doped lead zirconate titanate," *J. Appl. Phys.*, 102, 074119(1)-(7), 2007.
- [136] Y. Noguchi, I. Miwa, Y. Goshima and M. Miyayama, "Defect control for large remanent polarization in bismuth titanate ferroelectrics-doping effect of higher-valentcations," *Jpn. J. Appl. Phys.*, 39, L1259-L1262, 2000.
- [137] J.S. Kim, I.W. Kim, J.A. Cho, T.K. Song and K.S. Lee, "Ion doped effect on the ferroelectric properties in Nb-doped Bi₄Ti₃O₁₂," *J. Korean. Phys. Soc.*, 42, S1134-S1137, 2003.
- [138] D. Remiens, E. Cattan, C. Soyerand T. Haccart, "Piezoelectric properties of sputtered PZT films: influence of structure, micro structure, film thickness (Zr, Ti) ratio and Nb substitution," *Mater. Sci. Semicon. Proc.*, 5, 123-127, 2003.
- [139] E.G. Lee, D.J. Wouters, G. Willems and H.E. Maes, "Voltage shift and deformation in the hysteresis loop of Pb(Zr, Ti)O₃ thin film by defects," *Appl. Phys. Lett.*, 69, 1223-1225, 1996.