

Piezoelectric Properties of BiFeO₃-BaTiO₃ Ceramics and Thin Films

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Piezoelectric (1-x)BiFeO₃-xBaTiO₃ (BFBT100x) solid solution ceramics were prepared by using conventional solid state reaction process with thermal quenching process. High performances of piezoelectric properties and high Curie temperatures were observed due to the reduced secondary phases and improved leakage current properties of BFBT100x ceramics. Best direct sensor piezoelectric coefficient was observed in BFBT33 ceramics where mixed phases were observed. And best converse actuator piezoelectric coefficient was observed in BFBT40 ceramics where softer ferroelectric properties were observed than in BFBT33 ceramics. The physical origin of these improved results will be discussed.[1]

BFBT100x thin films were deposited by using pulsed laser deposition method. Polycrystalline thin films were prepared on platinized silicon substrates and best piezoelectric properties were observed in BFBT40 thin films by using piezoelectric force microscopy. The results were as good as those of lead-based thin films.[2] Epitaxial BFBT100x thin films were also prepared on LaAlO₃(100) [LAO(100)] substrates and were compared with the results of polycrystalline thin films. Various epitaxial BFBT40 thin films with different crystal orientations were prepared on LAO(100), LAO(110) and LAO(111) substrates. Their ferroelectric, piezoelectric and magnetic properties were observed. The relations between each property and crystal direction will be discussed.

[1] M.H. Lee *et al.*, High- Performance Lead- Free Piezoceramics with High Curie Temperatures, *Advanced Materials* **27**, 6976-6982 (2015).

[2] J. Park *et al.*, High piezoelectric performance of lead-free BiFeO₃-BaTiO₃ thin films grown by a pulsed laser deposition method, *RSC Advances* **6**, 106899-106903 (2016).