

Chapter-6

Advanced Ferroelectric Materials

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Abstract:

The wide range of applicable properties like P-E loops, high dielectric constant, high piezocoefficients, large pyroelectric coefficients, strong electro-optic effects, and the temperature-dependent resistance motivates the scientist to extend their further research work in it. This book chapter is specially designed to explore the earlier and recent investigations on the application-oriented multifunctional ferroelectric materials. It is also concluded that the lead-free zirconium-based piezoceramics can be a potential material for the multiapplication purpose by site -engineering method.

Keywords: Ferroelectrics, Hysteresis loops, Perovskites, lead-free, Curie Weiss Law.

6.1 Introduction to functional materials

“You may say anything you like but, we all are made up of ferroelectrics” - (B. T. Matthias).

The word “functional” is frequently used these days in combination with newly prepared materials, to signify their versatility for certain applications or merely to assign further significance to them. Certainly, a vast range of different compounds, ranging from biomaterials, liquid crystals, inorganic-organic hybrids, and block copolymer nanocomposites, to zeolites and silica, semiconductors with metal oxides, and metals, have previously been used to define functional material [1][2]. For all these materials, the definition is justified, since nearly every material may still be designated as a functional one - in particular, it is far more difficult to envision a substance that does not have any sort of purpose or functionality. From a “target-motivated” perspective, the properties of functional material are adapted and intended to enable a particular purpose. As they have a target-motivated approach, ferroelectric materials are also functional materials.