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Growth and charecterization of ferroelectric a strategic material for commercialization and usage

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Ferroelectric means certain materials possessing spontaneous polarized domains and whose direction of polarization can be reversed by application of applied electric field. Ferroelectrics are in general insulators. Ferroelctricity is found in special group of compounds which synthesizes in structures having no centre of symmetry. It is never found in an element .They have permanent dipole moment and therefore they are referred as polar dielectrics .Some of the most common structures in which ferroelectric materials crystallize are tetragonal, orthorhombic, monoclinic, tungsten bronze, perovskite, pyrochlore. Ferroelectric materials discovered by Valasek in 1920 in the form of bulk crystals of Rochell salt. Since then the materials have been prepared primarily in the form of bulk crystals; ceramics; polymers and thin films-increasing their exploitability. Ferroelectric materials offer a wide range of useful properties namely ferroelectric hysteresis, high permittivity, high piezoelectric effects, high pyroelectric coefficient, strong electro-optic effects etc. The characteristics of ferroelectric materials enables to explore the drastic change in their properties if the material is synthesized in the Nano range. Physical and chemical methods are found to be of great significance for the various applications. In my work, have grown pure and rare-earth doped potassium niobate crystals, a perovskite characterised using XRD, DTA, SEM, and ICPA. The material has been explored by studying its dielectric, conductivity, pyroelectric study it is found that the rare earth doping is found to act as a growth habit modifier, dopant substitution influences the local polarisation in the crystals, its conductivity has been also due to polaron hopping responsible for the generation of vacancy site distribution. An attempt has been made to quantify the radius of polaron hopping due to rare-earth doping. Recently special focus has been given to ferroelectric nanostructures that represents better sensing properties than their bulk counterparts. To name the various applications of Nano ferroelectrics in different type's gas sensors, piezoelectric and pyroelectric sensors of mechanothermal signals as photo detectors, ionising radiation detectors and biosensors. However, the future scope has been recently reported to be an overlapping of physical, chemical along with biological methods in exploring the ferroelectric materials namely BaTiO3 nanoparticle to have great commercial potential.

Biography

Dr. P.D.Durugkar has completed his PhD in Physics at VNIT Nagpur University . Having Fourteen years of teaching experience as Assistant Professor in Department of Physics Saint Francis De Sales college affiliated to R.T.M. Nagpur University ,Nagpur. Recognised supervisor for Ph.D. and an active member of Board of studies in faculty of science namely physics in R.T.M. Nagpur University, Nagpur..Published research papers in international reputed journals namely Crystal growth and Ferroelectrics. Attended and participated in National and Inter National seminar / conference publishing research papers.Have a passion for teaching and research.

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