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Effect of stabilization heating on the piezo-, di- and ferro (PDF) electric behavior of PMN PT ceramic in the MPB

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$(1-x) [\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3] - x[\text{PbTiO}_3]$ belongs to the category of relaxor ferroelectrics, is a suitable material for the piezoelectric applications and exhibit composition dependant response to external stimulus. Wide range of dielectric constants, low dielectric loss and high coupling make PMN-PT outstanding among relaxors. Synthesis of phase pure PMN-PT without pyrochlore is a challenge, which is as much an art as it is science. We could achieve device quality stoichiometric PMN-PT ceramic through novel modulated heating coupled with partial covering method. Samples prepared with and without excess PbO, showed nearly identical electrical behavior. High temperature stabilization was administered to the samples in two different ways and was found to be successful in realizing stoichiometric and device quality ceramic. Phase formation and electrical analysis attested the utility of the ceramic and the method of preparation. The unusual PDF-electric behavior of the samples may be attributed to quality of grinding, stabilization heating and big grains with limited grain boundary free of PbO inclusion. In my presentation, I will be giving a comparative study of piezoelectric, dielectric and ferroelectric behavior of two sets of samples prepared by administering stabilization heating in two different ways. XRD, Raman, XPS and SEM analysis of the composition will be outlined along with PDF-electric studies. PLD grown thin films on bare and $\text{La}_{0.5}\text{Sr}_{0.5}\text{CoO}_3$ (LSCO) deposited platinised silicon substrate and topographic studies using AFM will also be presented. We are trying to develop large area PMN-PT thin films for under water sensor applications.

Biography

Pius Augustine is a Research Scholar at the Department of Physics, IIT Madras. His research work is on 'Ferroelectric and Piezoelectric thin film development for device applications'. His research interests are relaxors in general and $\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$ - PbTiO_3 in particular. Synthesis of pyrochlore free PMN-PT through a modulated heating in combination with a partial covering method.

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