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

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Introduction

(1-x)PMN-(x)PT is a relaxor ferroelectric material. The properties of this material depends on the % of PT. Composition with x=33% to 36% shows compositional fluctuations and exhibit excellent piezo-, di- and ferro (PDF) electric behavior and make it a potential candidate for various applications.

"***Synthesis of single phase PMN-PT is an art as it is science***".

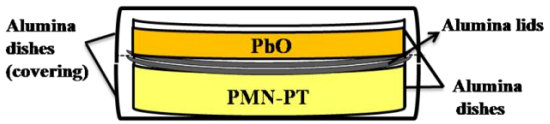
Aim

A high temperature of 1050 ^{o}C for 4 h during synthesis was given to stabilize the PMN-PT perovskite phase. This study aimed at the synthesis of pyrochlore-free and device quality PMN-PT ceramics and to study the effect of stabilization heating on the PDF properties of PMN-PT at the MPB (morphtropic phase boundary) (x = 35).

Materials and methods

Single phase columbite-like $MgNb_2O_6$ and partial covering method combined with modulated heating were used to realize device quality PMN-PT ceramics. A detailed account of the synthesis is available in our publication-

http://dx.doi.org/10.1016/j.ceramint.2015.06.010



Results and discussion

XRD, Raman spectroscopy, piezo, di- and ferroelectric properties established the high quality of the ceramics prepared (see graph section). Stabilization heating was found to be very effective in improving the quality of the ceramic prepared. Correlation of microstructure of the samples prepared with electrical property of the ceramics were analyzed and was found to be promising.

d33	=	**402 pC/N**
ε'max (at 10 kHz)	=	**19,824**
P_{sat}	=	**31.5 μC/cm^2**

Conclusion

The piezoelectric, dielectric and ferroelectric behavior exhibited by the samples were at par or even superior to the earlier reported values. Stabilization is found to be effective in synthesis.

Acknowledgments

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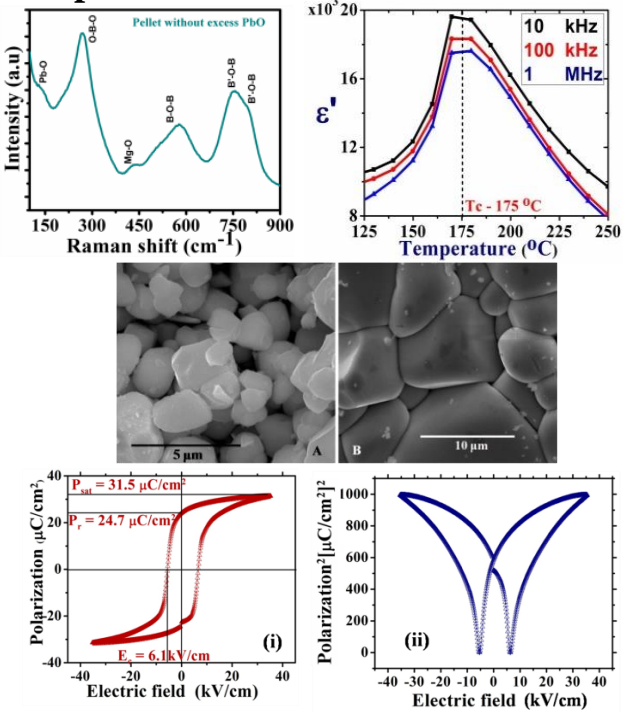
Tables

PMN-PT	*d33* pC/N	ε' (at 10 kHz)	P_{sat} μC/cm^2
Wtih excess PbO	392	20,000	35.5
Without excess PbO	402	18,000	31.5

Graphs



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thanks