Accepted Manuscript

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PII: S0925-8388(18)31598-6

DOI: 10.1016/j.jallcom.2018.04.275

Reference: JALCOM 45913

To appear in: *Journal of Alloys and Compounds*

Received Date: 24 January 2018

Revised Date: 23 April 2018

Accepted Date: 24 April 2018

Please cite this article as: S. Dinesh Kumar, J. Magesh, V. Subramanian, Temperature dependent magnetoelectric studies in co-fired bilayer laminate composites, *Journal of Alloys and Compounds* (2018), doi: 10.1016/j.jallcom.2018.04.275.

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ACCEPTED MANUSCRIPT

Temperature dependent magnetoelectric studies in co-fired bilayer laminate composites

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Abstract

Temperature dependent magnetoelectric studies are performed for 0.37 $BiScO_3$-0.63 $PbTiO_3$-$NiFe_2O_4$ laminate composites in the temperature range of 25°C to 200°C. The co-fired laminates are sintered at two different temperatures, 1100°C and 1200°C, closer to the sintering temperature of the ferroelectric and ferrite phases. The effect of sintering temperature on co-fired laminates is investigated by analyzing the structural, morphology, ferroelectric properties along with the direct and converse magnetoelectric coefficients. With increase in sintering temperature, the magnetoelectric coupling coefficient of the co-fired laminate is found to increase. The direct magnetoelectric coefficient of co-fired laminate, sintered at 1200°C, is found to be comparable to that of the epoxy bonded laminate. Finally, the temperature dependent direct magnetoelectric studies are carried out in co-fired laminates and the results are compared with that of epoxy bonded laminate. The magnetoelectric interaction in epoxy bonded laminate, strongly affected by temperature, can be ascribed to softening of the epoxy layer. The co-fired laminate, which has no epoxy layer, exhibits a better thermal stability in terms of stable magnetoelectric coefficient up to 200°C making it a suitable candidate for high temperature magnetic field sensors.

Keywords: Direct magnetoelectric effect; Converse magnetoelectric effect; Co-fired laminate; Epoxy bonded laminate; High temperature sensor.

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