11th International Conference
on Advanced Materials

Rio de Janeiro Brazil
September 20 - 25

ICAM2009

$BiNbO_4$ Ceramics in Microwaves: Synthesis and Characterization

T. S. M. Fernandes[(1)*], A. J. M. Sales[(1)], J. S. Almeida[(1,2)], M. A. S. Silva[(1)], A. C. F. Silva[(2)] and

A. S. B. Sombra [(1,2)]

(1) Telecommunications and Materials Science and Engineering Laboratory (LOCEM)
sombra@fisica.ufc.br,
(2) Physics Department, Federal University of Ceará - UFC, 60455-760 Fortaleza – CE – Brazil
www.fisica.ufc.br, * Corresponding author.

Abstract – The sintering behavior, microstructure and microwave dielectric properties of BiNbO4 ceramics have been investigated. The phase-forming temperature (from orthorhombic to triclinic phase) of BiNbO4 ceramics during sintering is lower than that (1025 ◦C) of BiNbO4 ceramics. The variations of dielectric constant and *Q* value are also investigated. These compounds were prepared by the traditional solid state method. The phase purity and lattice parameters were studied by powder X-ray diffraction (XRD).

In this research, the properties dielectrics in microwaves of $BiNbO_4$ with phase transition was investigated as a function of sintering temperature. It is necessary to study the intrinsic properties of $BiNbO_4$ with phase transition to predict and control the dielectric properties at microwaves frequencies [1]. $BiNbO_4$ ceramics were prepared by the conventional mixed oxide method. The raw materials, Bi_2O_3 and Nb_2O_5, which had higher purity than 99,9%, were mixed for 2 hours in mill of high rotation with balls of ZrO_2, later roasted to several temperatures by 3h. Crystalline phases of the calcined powders and the sintered specimens were identified by XRD pattern analysis in the range 20 – 80° of using Cu Kα radiation. However, the phase $BiNbO_4$ roasted in the temperature of 850 ℃, it presented a quite good result. The dielectric constant (*K*) and the unloaded *Q*(1/tanδ) of the specimens at 4-6 GHz were measured by Hakki and Coleman's method. It can be studied for application in microwave divice materials and in ceramic capacitors of multilayers [1,2].

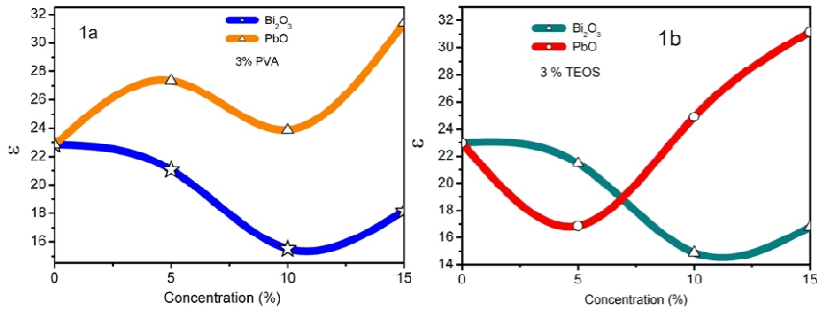

Figure 1: Dielectric permittivity (ε_r) as afunction concentration **a)** Doping PVA and **b)** Doping TEOS.

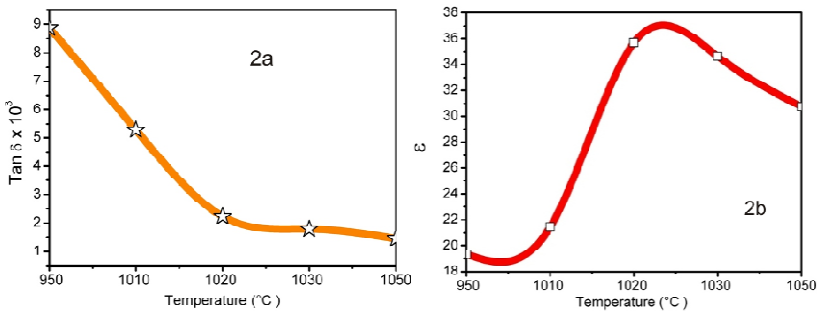

Figure 2: a) Tan loss as a function temperature. **b)** Dielectric permittivity (ε_r) as a function temperature.

[1] D. Liu, Y. Liu, S.Q. Huang, X. Yao, J. Am. Ceram. Soc. 76 (1993) 2129–2132.

[2] Eung Soo Kim, Woong Choi, Effect of phase transition on the microwave dielectric properties of $BiNbO_4$ – Journal of the European Ceramic Society 26 (2006) 1761-1776