

# ECAPD IV '98

*European Conference on  
Applications of Polar Dielectrics*



## ISAF XI '98

*International Symposium on  
Applications of Ferroelectrics*



# Electroceramics VI '98

*International Conference on Electroceramics  
and their Applications*



*Montreux, Switzerland  
24 - 27 August 1998*



ÉCOLE POLYTECHNIQUE  
FÉDÉRALE DE LAUSANNE

# ABSTRACT BOOK

*with Program*

## Poster presentations - Monday (A) - Level A2

A - A2 - P2 - 189

14:00 - 16:00

Abstract No. 339

### FORMATION AND PROPERTIES OF SEMICONDUCTING BARIUM TITANATE DOPED WITH TITANIUM COMPOUNDS AND NITRIDES. L.L. KOVALENKO, O.I. V'YUNOV, A.G. BELOUS (Institute of General & Inorganic Chemistry, Kyiv, Ukraine)

The aim of the work was to elucidate the character of action of the dopants  $\text{TiB}_2$ ,  $\text{TiC}$ ,  $\text{TiN}$ ,  $\text{BN}$ ,  $\text{AlN}$  and  $\text{ZrN}$  on the synthesis process and electrophysical properties of barium titanate-based semiconducting ceramics. The research resulted in the following:

- At low concentrations of the dopants  $\text{TiB}_2$ ,  $\text{TiC}$  and  $\text{TiN}$ , the resistivity passes through a minimum at 0.3, 0.1, and 0.7 mol.% respectively; this may be accounted for by the formation of a weakly reducing atmosphere and a liquid phase, which inhibits oxidation during cooling. The resistance rises on further increasing the dopant concentration due to an increase in the amount of superstoichiometric  $\text{TiO}_2$ . The differences in concentrations at which the resistivity minimum is observed are accounted for by the different character of oxidation of dopants and in the case of  $\text{TiB}_2$  by the formation of the low-melting compound  $\text{BaTi(BO}_3)_2$  (along with oxidation processes).
- Semiconducting properties are formed in a narrow range of  $\text{AlN}$  and  $\text{ZrN}$  concentration (down to 2-5 mol.%). This is accounted for by the diffusion of the  $\text{Al}^{3+}$  and  $\text{Zr}^{4+}$  ions from the boundary into semiconducting barium titanate grains. The sintering temperature of  $\text{AlN}$  and  $\text{ZrN}$ -doped semiconducting ceramics is  $1360^\circ\text{C}$ , addition of the dopants  $\text{TiB}_2$ ,  $\text{TiC}$  and  $\text{TiN}$  lowers the sintering temperature to  $1330^\circ\text{C}$ , and addition of boron nitride lowers it to  $1300^\circ\text{C}$ .
- The widening of the temperature range of reduction correlates with the temperature stability of dopants under investigation and increases in the orders  $\text{TiC-TiB}_2\text{-TiN}$  and  $\text{ZrN-BN-AlN}$ . Investigations of the microstructure of samples show that when the mineralizers investigated are added, a decrease in crystallite size is observed. The effect of boride, carbide and nitride dopants on electron transitions in semiconducting barium metatitanate has been studied.

A - A2 - P2 - 190

14:00 - 16:00

Abstract No. 340

### INVESTIGATIONS ON THE SYNTHESIS OF $\text{Bi}_3\text{NbTiO}_9$ CERAMICS, A.LISINSKA-CZEKAJ\*, D.CZEKAJ\*, M.F.KUPRIANOV\* (\*University of Silesia, Katowice, Poland, \*Rostov State University, Rostov-on-Don, Russia).

The perovskite-layered ceramics of  $\text{Bi}_3\text{NbTiO}_9$  (BNT), also known as Aurivillius phase, was obtained. The process of preparation was investigated by X-ray diffraction method. The synthesis of BNT was carried out according to the solid-state reaction from the conventional mixture of oxides ( $\text{Bi}_2\text{O}_3$ ,  $\text{TiO}_2$ ,  $\text{Nb}_2\text{O}_5$ ) within the temperature range  $T = 400 - 1200^\circ\text{C}$ . The influence of the addition of  $\text{NaCl}$  on the process of synthesis was also investigated. It was found that above  $T = 900^\circ\text{C}$  the ratio of the  $\text{Bi}_3\text{NbTiO}_9$  phase was almost 90% and the admixture of  $\text{NaCl}$  decreased the synthesis temperature. Dependence of the amount of the BNT phase in the bulk material versus the temperature of synthesis is given. Evolution of the structural parameters of BNT and  $\text{NaCl}$ -modified BNT at different synthesis temperatures was shown, as well as optical characteristics.