DIELECTRIC PROPERTIES OF $ATiO_3$ CERAMICS (A=Ca, Sr, Ba) SINTERED WITH 5 Mol. % OF LiF AND CaF_2

Laldja Taïbi-Benziada[1*]; Youcef Sedkaoui[2]

[1]*Faculté de Chimie, USTHB, B.P. 32, El-Alia, 16311 Bab-Ezzouar, Alger, Algérie*

[2]*Institut des Sciences, Centre Universitaire Akli Mohand Oulhadj, Bouira, Algérie*

Topic A: Dielectric, piezoelectric and ferroelectric materials

The spectacular development in new technologies of information and communication (NTIC) during the last decade has tremendously urged the research in engineering ceramics. The perovskite-type family ABO_3 and, specifically the titanates $ATiO_3$, attracted more and more scientists worldwide because of their large area of applications. Among $ATiO_3$ ceramics, $CaTiO_3$ (CTO), $SrTiO_3$ (STO) and $BaTiO_3$ (BTO) became the key materials post-PZT. The aim of the present work is the comparison of the dielectric properties of CTO, STO and BTO sintered with 5 mol. % of (LiF + CaF_2).

CTO, STO and BTO were previously synthesized by calcination of stoichiometric amounts of ACO_3 (A = Ca, Sr, Ba) and TiO_2. 95 mol. % of the prepared ATO powders were mixed with 5 mol. % of (LiF + CaF_2) then wet-ground in ethanol. These mixtures were cold-pressed into pellets and air-fired at 1000 ° C for 2 h. The ceramics thus obtained were investigated by X-ray diffraction (XRD) and scanning electron microscopy (SEM). Dielectric measurements (DE) were carried out from 100 K up to 500 K in the frequency range 10^2 Hz – 4 x 10^7 Hz.

As results, the XRD patterns show each sample to be a perovskite single phase. In comparison with ATO, the fluorinated ceramics show compact microstructures. The shrinkages $\Delta\Phi/\Phi$ are in the range 13 – 22 %. The oxyfluoride deriving from CTO exhibits a sharp peak of ε_r and $\tan\delta$ around 10 ° C. For STO, no phase transition is detected in the temperature range investigated. On the other hand, the ceramic related to BTO displays a broad maximum of the dielectric permittivity ε_r and a minimum of the dielectric losses $\tan\delta$ at the ferroelectric Curie temperature $T_C \sim 20$ ° C. Moreover, a dielectric relaxation is observed at about 10 MHz. These oxyfluoride ceramics could be of interest for capacitors manufacturing.

Keywords: $ATiO_3$ perovskite; Oxyfluoride; Ceramics; Dielectric properties.