EFFECTS OF $0.03MF_2 – 0.12LiF$ (M = Ca, Sr, Ba) ON THE SINTERING AND THE DIELECTRIC PROPERTIES OF $SrTiO_3$ CERAMICS

L. Taïbi-Benziada[1], H. Kermoun[1], Y. Belaroussi[2]

[1]*Faculty of Chemistry, USTHB, P.O. Box 32, El-Alia, 16311 Bab-Ezzouar, Algeria*

[3]*Centre de Développement des Technologies Avancées, Cité du 20 Août, B.P. 17, Baba- Hassan, Algérie*

In recent years, the spectacular development in new technologies of information and communication (NTIC) and the miniaturization of devices have extraordinarily increased the needs of multifunctional ceramics with better and better electrical properties but also with lower and lower factory cost to be competitive on the huge market of microelectronics. The titanates $ATiO_3$, attracted more and more scientists worldwide because of their large area of applications such as monolithic microwave integrated circuits (MMIC), radiofrequency integrated circuits (RFIC), cellular phones, wireless local area networks (WLAN) and global positioning systems (GPS). Among $ATiO_3$ ceramics, $CaTiO_3$ (CTO), $SrTiO_3$ (STO) and $BaTiO_3$ (BTO) became the key materials for the replacement of lead-containing materials.

The purpose of the present study is to lower the sintering temperature of pure STO which is too high ($T_{sint.}$ ~ 1400 - 1500 °C). Cold-pressed pellets are prepared from $SrTiO_3$ - $0.03MF_2$ - 0.12LiF (M = Ca, Sr or Ba) then air-fired at 950 °C for 2 hours. The obtained samples are investigated by XRD, SEM and dielectric measurements.

As results, each ceramic is a perovskite single phase and the relative density reaches 95% for all ceramics. The additives induce a strong modification in the $SrTiO_3$ cubic cell. The dielectric permittivity ε'_r shows no maximum in the temperature range investigated (- 150 °C $\leq T \leq$ 200 °C) and is almost frequency independent. At room temperature, the dielectric losses $tan\delta$ are less than 0.1 %. Moreover, the frequency dependence of the complex permittivity exhibits a resonance in the microwave region. These fluorinated ceramics could be of interest in piezoelectric devices and are promising dielectrics for class I capacitors manufacturing at low temperature.

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