SINTERING, STRUCTURAL AND DIELECTRIC INVESTIGATIONS IN NEW CERAMICS $Sr_{0.90}M_{0.10}(Ti_{0.90}Li_{0.10})O_{2.70}F_{0.30}$ (M=Ca, Sr, Pb)

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The perovskite type-oxides ABO_3 and their related materials are especially important for technological applications in microelectronic industry. During the last decade, researches on these compounds are rapidly progressing. Among these oxides, $SrTiO_3$ is of particular interest in memory devices. Strontium titanate is a paraelectric material with a cubic structure at room temperature. This perovskite undergoes two phases transitions orthorhombic $\xleftrightarrow{65K}$ tetragonal $\xleftrightarrow{110K}$ cubic. In a previous work, the systems $SrTiO_3$-MF_2-LiF (M=Ca, Sr, Pb) were investigated and several oxifluorides with general formula $Sr_{1-x}M_x(Ti_{1-x}Li_x)O_{3-3x}F_{3x}$ were obtained. This study is mainly focussed on the sintering and the characterization of ceramics with nominal compositions $Sr_{0.90}M_{0.10}(Ti_{0.90}Li_{0.10})O_{2.70}F_{0.30}$.

The powder of $SrTiO_3$ is previously prepared at 1100°C. Cold-pressed pellets with initial compositions $0.90SrTiO_3$-$0.10MF_2$-0.10LiF are sintered in free-air at 950°C for 2 hours. X-ray powder diffraction analyses are carried out on these samples. Dielectric measurements are performed from 300K to 800K in the frequency range $100Hz \leq f \leq 40MHz$. The phases $Sr_{0.90}M_{0.10}(Ti_{0.90}Li_{0.10})O_{2.70}F_{0.30}$ crystallize in an orthorhombic complex perovskite isomorphous to $NaNbO_3$ whereas pure $SrTiO_3$ is cubic. For strontium titanate no phase transition is observed in the temperature range investigated. On the other hand two or three dielectric phenomena, which could be ascribed to structural changes, are observed for these oxifluorides. At room temperature, the frequency dependence of the complex permittivity $\varepsilon_r^* = \varepsilon_r^{'} - i\varepsilon_r^{''}$ exhibits a strong dielectric dispersion. Such behaviour could be attributed to a resonance or to a relaxation phenomenon. The ceramics $Sr_{0.90}M_{0.10}(Ti_{0.90}Li_{0.10})O_{2.70}F_{0..30}$ are promissing materials for various applications.

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