$CaTiO_3$ RELATED MATERIALS FOR RESONATORS

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Nowadays, advanced ceramics became the key of success for the development of integrated circuits in microelectronic industry. Calcium titanate $CaTiO_3$ belongs to the perovskite-type oxides which are important in several fields of research (material sciences, physics, earth sciences…) and applications. In material sciences, $CaTiO_3$ is well known for its phase transitions and in earth sciences as an important mineral in the Earth's lower mantle. Moreover, recently $CaTiO_3$ entered the quantum paraelectrics family like $SrTiO_3$ and $KTaO_3$. In previous works we studied the chemical systems $CaTiO_3 – MF_2 – LiF$ (M = Ca, Sr or Pb). As a result, three novel solid solutions with general formula $Ca_{1-x}M_x(Ti_{1-x}Li_x)O_{3-3x}F_{3x}$ were obtained. In this paper we investigate the physical properties of $Ca_{0.95}M_{0.05}(Ti_{0.95}Li_{0.05})O_{2.85}F_{0.15}$ ceramics where M is Ca, Sr or Pb element.

Ceramics of $Ca_{0.95}M_{0.05}(Ti_{0.95}Li_{0.05})O_{2.85}F_{0.15}$ were prepared from mixtures of $CaTiO_3$, MF_2 and LiF powders then sintered at 950°C for 4 hours in free-air. The samples obtained in these conditions were investigated by X-ray diffraction (XRD), scanning electron microscopy (SEM), differential scanning calorimetry (DSC) and dielectric measurements.

The phase transitions of $CaTiO_3$ are strongly influenced by the incorporation of the fluorid mixture MF_2+LiF into the host lattice whereas the symmetry at room temperature is not at all affected by the chemical substitutions Ca – M, Ti – Li and O – F. The dielectric permittivity ε'_r and losses $\tan\delta$ are practically independent of temperature between 25°C and 250°C. At room temperature, ε'_r is stable and close to 100 in the frequency range 10^2 Hz – 10^7 Hz with $\tan\delta < 0.01$. These phases are promising materials to manufacture resonators for microwave circuits.

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