SYNTHESIS AND CHARACTERIZATION OF NEW PHASES WITH COMPOSITION $Sr_{1-x}Na_x(Ti_{1-x}Mg_x)O_{3-3x}F_{3x}$

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Dielectric ceramics ABO_3 have numerous properties and are of interest for a wide range of applications the recent one being the incorporation in computer memories whose microchips combine transistors, resistors and capacitors. Among these materials, barium titanate ($BaTiO_3$), strontium titanate ($SrTiO_3$) and their solid solutions have been intensively studied worldwide. For example , the solid solution $Ba_{1-x}Sr_xTiO_3$ is commonly used as capacitors for DRAMs by several manufacturers (NEC , Samsung , Motorola , IBM ,…) since these phases have high charge storage densities , low leakage currents and resistance against time-dependent dielectric breakdown sufficient to achieve gigabit densities and beyond . In this work, we focused attention on new fluoridated materials deriving from $SrTiO_3$.

Strontium titanate was previously synthesized. Various starting compositions were then prepared from a mixture of $SrTiO_3$, NaF and MgF_2:

$$(1\text{-}x)\ SrTiO_3 + x\ NaF + x\ MgF_2 \rightarrow Sr_{1-x}Na_x(Ti_{1-x}Mg_x)O_{3-3x}F_{3x}$$

All the powders were prepared by solid state reaction. Weighing, mixing, grinding were performed in air and heating in platinium crucibles. The oxyfluorides thus obtained were checked by X-ray powder diffraction. The phase transitions in these new compounds were investigated by differential scanning calorimetry (DSC) and dielectric measurements. DSC analysis were carried out on powder samples from room temperature up to 873K and the dielectric measurements were performed on ceramics over the temperature range 298 – 773K at 100 Hz then 1 kHz.

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