

Microwave dielectric relaxation process in doped-incipient ferroelectrics

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Abstract

The electrical permittivity properties in the microwave frequency range were investigated in the incipient and relaxor compositions of $\text{Sr}_{1-x}\text{Ca}_x\text{TiO}_3$ ceramics from 60 K to 440 K. The results revealed that the origin of microwave dielectric relaxation process lies in the appearance of nanometric polar regions rather than any other ferroelectric or piezoelectric mechanism. The experimental data also showed that the relaxation frequency of such process may be associated with the presence and vibration of the boundaries of nano-sized polar regions, which persist up to the Burns temperature. The influence of frozen dipole moment connected with the grain boundaries on the formation of nano-sized polar regions and its relationship with the microwave dielectric relaxation process is also discussed