Microwave Dielectric Relaxation in doped Incipient Ferroelectrics

Manuel H. Lente, Talita Mazon, Jose De Los Santos Guerra, Antonio C. Hernandes, Jose A. Eiras

Universidade Federal de So Carlos - Brazil

Abstract

In order to investigate the exact contribution of each mechanism for the electrical permittivity response, dielectric measurements covering a wide frequency range (dielectric dispersion) are often required. Ferroelectrics and related materials emerge from the dielectric class as the highest dielectric constant materials, even when compared to other polar systems. In this context, over the last years several efforts have been made in order to identify the mechanisms responsible for the dielectric relaxations in the microwave range in incipient and relaxor ferroelectrics. However, the exact origin of the microwave dielectric relaxation processes is still debated. For this reason, in this work it was investigated the dielectric dispersion of Ca: SrTiO3 (SCT) ceramics in a frequency and temperature range from 80 MHz to 2 GHz and 80 K to 450 K, respectively, in order to determine the physical origin of microwave dielectric relaxations found in the SCT system in its quantum paraelectric and relaxor compositions. The results revealed clearly that the dielectric relaxations may be always associated with the presence of nano-sized polar regions that persist up to the Burns temperature, thus suppressing the relaxations. The influence of defects on the formation of nano-sized polar regions and its relationship with the microwave dielectric relaxation is also discussed.