BROADBAND DIELECTRIC STUDIES OF $Bi_{5-x}Gd_xTi_3FeO_{15}$ CERAMICS

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Multiferroic materials are attracting attention from scientist and industry for potential multifunctional applications in modern technologies, like high energy density capacitors, spintronics devices, sensing applications, etc. [1]. One of promising multiferroic compounds are $Bi_5Ti_3FeO_{15}$ family ceramics exhibiting high-temperature ferroelectric and ferromagnetic behavior. Rare-earth ion insertion causes lattice distortions and, consequently, changes related to the ferroelectric and magnetic properties of these compounds [2]. Despite of several studies, the influence of Bi substitution by Gd on the functional properties of $Bi_{5-x}Gd_xTi_3FeO_{15}$ is not clear yet. Thus, the aim of this work was to show broadband dielectric spectra of these compounds (x = 0.1, 0.2, 0.3, 0.5 and 1).

The complex dielectric permittivity of $Bi_{5-x}Gd_xTi_3FeO_{15}$ ceramics was investigated in the temperature range from 300 K to 1070 K by the broadband high frequency impedance spectrometer [3]. The dielectric spectra reveal a pronounced increase due to conductivity-related effects starting from ~600 K. At temperatures above 990 K a jump in the real part of the dielectric permittivity, related to the ferroelectric phase transition, appears which moves slightly toward higher temperature with the increase of Gd content. Analysis of the complex impedance in the frequency domain shows Arrhenius-like behavior while the change in activation energy is clearly visible in the temperature region around the phase transition temperature.

References

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