497. Title:Raman and brillouin scattering study of lead-free ferroelectric (1-X)Na0.5 Bi0.5)TiO3-xBaTiO3 single crystals

Authors:Onda, Yosuke (1); Tsukada, Shinya (1); Kojima, Seiji (1)

Source title:Ferroelectrics
Volume:412
Issue:1
Issue date:2011
Publication year:2011
Pages:52-58
Language:English
Document type:Journal article (JA)

Abstract:Broadband inelastic light scattering spectra of (1-x)(Na 0.5Bi0.5)TiO3-xBaTiO3 single crystals are measured in the frequency range between l GHz and 20 THz to investigate the peculiar behavior of the polarization and the origin of diffusive dielectric anomaly. In the light scattering spectrum in the lGHz-10 THz range, a quasielastic central peak (CP) is observed, while in the light scattering spectrum in the 1 THz-20 THz, optical phonon modes are observed. The central peak shows the remarkable narrowing toward the peak temperature ofdielectric constant Tm on the cooling from the high temperature for above Tm, this fact indicates that the relaxation of polarization shows slowing down towards Tm. The contribution of the relaxation of polarization to the dielectric property can be demonstrated using the generalized Lydanne-Sachs-Teller (LST) relation including the relaxation modes. The calculated value by the generalized LST relation shows good agreement with observed dielectric constant. This fact suggests that the relaxation of local polarization causes the anomaly of the dielectric constant. The diffusive peaks of the dielectric constant and the relaxation time determined from the CP are reproduced by the extended Curie-Weiss law and the stretched critical slowing down to evaluate the diffuseness of these peaks quantitatively. With increasing of x, these peaks become more diffusive. This result strongly suggests that the diffuseness of these peaks is related to the strength of the random field generated by the disordering of cations at A-site in perovskite structure.