DIELECTRIC DISPERSION AND DISTRIBUTION OF THE RELAXATION TIMES OF THE RELAXOR 0.4PSN-0.3PMN-0.3PZN CERAMICS

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Relaxor ferroelectrics are characterized by significant frequency dependence of their peak permittivity. In this contribution the dielectric spectra of new relaxor ceramics 0.4PSN-0.3PMN-0.3PZN is presented. Measurements have been performed in the frequency range 20 Hz to 2 GHz. On cooling the dispersion and loss spectra strongly broaden and slow down, but remain symmetric so that the Cole-Cole model is applicable. This enabled us to determine also the width of the uniform distribution function of the relaxation times and its temperature dependence above room temperature. The longest and mean relaxation times diverge according to the Vogel-Fulcher law with the same freezing temperature T_{FV} = 210 K. The shortest relaxation time is about ps and remains almost temperature independent. The spectra are compatible with the Jonscher universal law and the broadening indicates a strong increase in inter-cluster correlation. Below room temperature the spectra become so broad that the low-frequency cut-off is much below 20 Hz (our lowest measured frequency) and the losses become independent of frequency. Appreciably high and temperature dependent losses and permittivity dispersion were observed also below T_{VF} in the nonergodic frozen phase. The quantitative estimates indicate a strongly anharmonic potential for polarization fluctuations which are restricted to inter-cluster boundaries. We can conclude, that the extraction of continuous relaxation times distribution of the Debye fundamental processes directly from the broadband dielectric spectra allows better understanding dynamic phenomena in solid state.