

The delay time of phase transition to the polar phase in relaxors: influence of ultraviolet illumination

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Relaxors have been subject to intensive research for a long time. Interest in these compounds is determined by a combination of ferroelectric, piezoelectric and optical properties and the possibility of using these materials in data storage systems and optoelectronics. The distinguishing features of relaxors are a strongly diffuse maximum in the temperature behavior of permittivity, the shift of this maximum toward higher temperatures with rising measuring field frequency, and a strong frequency dependence of permittivity at very low frequencies. Numerous experimental data show that the properties of the low-temperature phase depend on the history of samples, therefore, the non-ergodic behavior is observed in the low-temperature phase [1]. In an applied electric field, the transition to a uniform state of polarization is observed in the low-temperature phase after zero-field cooling. Such a phase transition was observed in [1] after a sufficiently long delay time had passed from the beginning of field application. The dependences of delay time t_0 of the phase transition on temperature T and external electric field E were established. The observed regularities have been discussed using an approach [2] developing on the basis of the model of diffuse phase transition in the system with defects [3].

We have investigated the delay time t_0 of the phase transition in $\text{PbMg}_{1/3}\text{Nb}_{2/3}\text{O}_3$ single crystal and in PLZT transparency ceramic sample, and we have found out the influence of ultraviolet illumination on this process. The delay time t_0 of the phase transition have been measured for different temperatures and different applied electric fields. It is shown previously that in the frame of the theoretical approach [2] the delay phase transition in polar phase in relaxors could be explain if the dynamic of electron system would be take in consideration. The photoconductivity properties have been discussed and correlation of observed results with developed model [2, 3] is discussed.

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