FORMATION OF PYRAMIDAL ISLANDS UPON GENERATION OF RADIATION-INDUCED DEFECTS

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The constant interest in relaxors is caused by their prospective use as a light-induced information accumulating system. In addition, the presence of nano-sized domains ranks the relaxor materials among the model objects for the intensively developing nanotechnology.

TlInS2 is a subject of intensive research as layer semiconductor with high photo and x-ray sensitivity. Study of dielectric, polarization and pyroelectric properties of the crystals TlInS2 doped with Fe, Cr, Mn displays that the mentioned materials can be classified as relaxor ferroelectrics. Properties of the structural phase transitions in ferroelectics-semiconductors are known to be mainly conditioned by mutual effects of electron and lattice subsystems. In this aspect, it seems to be interesting to study mutual effects of electron and lattice subsystems in the doped semiconductor relaxor ferroelectrics TlInS2.

This work presents the results of study of optical and electrical properties, temperature dependences $\varepsilon(T)$ and pyrocoefficient $\gamma(T)$ for TlInS2 doped with 0,1 at. % Me (where Me- Cr, Mn, Fe. The work's objective was to establish temperature-dependent behavior of permittivity and determine temperature region for existence of stable relaxor (nanodomain) state of TlInS2<Me>.

The single crystals of TlInS2<Me> were grown from melt by the method of oriented crystallization. The measurements were carried out from facets cut athwart the polar axis. The facets were subjected to grinding, polishing and coating with silver paste. The permittivity was measured by AC bridges at 1, 10, 100KHz and 1MHz frequency, at 150-250K-temperature interval. Dielectric hysteresis loops were studied at 50Hz frequency under modified scheme of Sawyer-Tower. Pyroeffect was investigated by quasi-static method using universal voltmeter V7-30.

It was shown that the nanodomain relaxor - to - macrodomain ferroelectric state phase transition takes place at Tf≈176K. Burns temperature Td≈210K was determined by polarization measurements. The conductivity below Tf has a non-activated hopping character while in the Td - Tf temperature interval the conductivity shows an activated behavior with the activation energy of E=0.038 eV. On our opinion the presence of non-compensated nano-sized charges in incommensurats phase can be considered as a polar nanodomains in mesoscopic structure resulting in formation of quantum dots.

So, the spontaneous ordering of doped nano structures is caused by good combination of several factors, such as TlInS2 crystal cleavage, existing of incommensurate superstructure,

coincidence of phase transitions temperatures with the temperature of impurity centers filling.