Thermphysical properties of (TlInSe2)1-x(TlGaTe2)x

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The purpose of this work: thermodynamic analysis, the study of physical properties of (TlInSe2)1-x - (TlGaTe2)x (x = 0-1) solid solution crystals. Concentration dependence free energy change of solid solutions is characterized by a negative deviation from the additive dependence. This agrees with the physico-chemical analysis and testifies the unlimited solubility in the solid state in TlInSe2-TlGaTe2 system. Experimental results shows the frequency dependence of ε′ for (TlInSe2)0.5(TlGaTe2)0.5 and TlInSe2 for comparison. At frequencies f = 100 kHz ε′ values of solid solution are 1.5-3.3 times higher than that of TlInSe2. ε′ value of TlInSe2 decreased by one order, and (TlInSe2)0.5(TlGaTe2)0.5 to 2.6 times with increasing frequency from 50 kHz to 35 MHz. In other words, dielectric permittivity dispersion of (TlInSe2)0.5(TlGaTe2)0.5 solid solution decreased significantly in comparison with TlInSe2. The results demonstrate that the dielectric dispersion in the studied crystals TlInSe2 and (TlInSe2)0.5(TlGaTe2)0.5 has a relaxation nature. Based on thermodynamic analysis and concentration dependence of physical properties, it was found that there is anion-cation substitution in TlInSe2-TlGaTe2 system. Frequency dispersion of real and imaginary components of complex dielectric permittivity, loss tangent and ac-conductivity of crystals of solid solutions are studied in the 50 kHz - 35 MHz frequency range. Continuous series of (TlInSe2)1-x(TlGaTe2)x solid solutions is forming throughout entire concentration range. We determined dielectric characteristics of samples, their frequency dispersion and nature of dielectric losses.