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THE TEMPERATURE DEPENDENCES OF SPECIFIC HEATS AND THERMAL DIFFUSIVITIES OF SOME SAMPLES WITH FLUORITE STRUCTURE

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The BaF_2 crystal belongs to the superionic conductors with the phase transition of the type order - disorder. This phase transition is characterized by no abrupt change in electrical conductivity, with power-law divergence in the specific heat and with no change in lattice symmetry. At pure BaF_2 this phase transition was discovered at 967°C. The temperature of the transition - Tc - can be decreased by convenient substituents. Catlow supposed, that the most convenient is three-valence substituent, it decreases the value of the activation energy, necessary for the generation of anion sublattice disordering. Therefore the system BaF_2 + LaF_3 is studied.

From the DTA records follows, that the temperature of phase transition decrease linearly with concentration of LaF_3. For example, the Tc for BaF_2 + 25 mol % LaF_3 is about 790°C, for BaF_2 + 31 mol % LaF_3 is about 770°C. The DTA curves were scanned with the DTA 990 instrument. The transition temperatures were taken from the minima of the endothermic peaks.

The thermophysical parameters - thermal diffusivity "k" and specific heat "c" were measured with the pulse method. The measuring device and the data processing are automatized and controlled with the calculator EMG 666, connected to the device online. At the figs. 1, 2, 3, 4, are the curves of temperature dependences of "k" and "c" for pure and doped BaF_2. The thermal conductivity "λ" can be calculated from "k" and "c" by the relation: $\lambda = k \cdot c \cdot \rho$, where ρ is the density of sample. For pure BaF_2 ρ is 4,89 g. cm^{-3}, for BaF_2 + 31% LaF_3 ρ is 5,3015 g. cm^{-3}.

The reduced value of "k" and increased value of "c" for BaF_2 + 31% LaF_3 indicates the process of structural disordering, which is observed already at room temperature.

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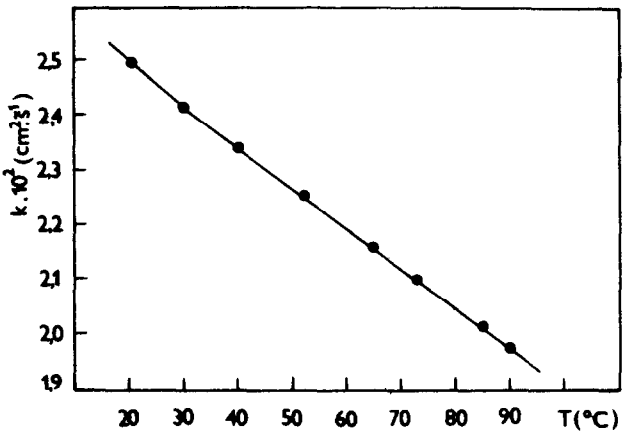
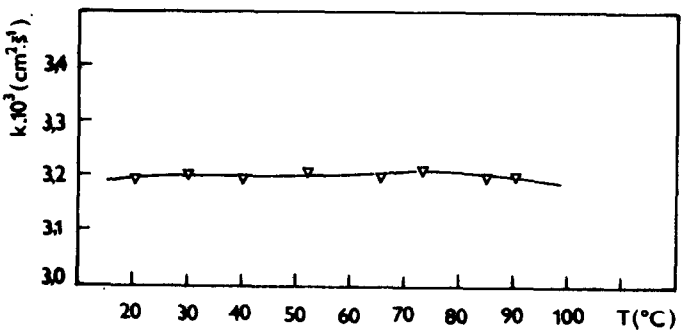
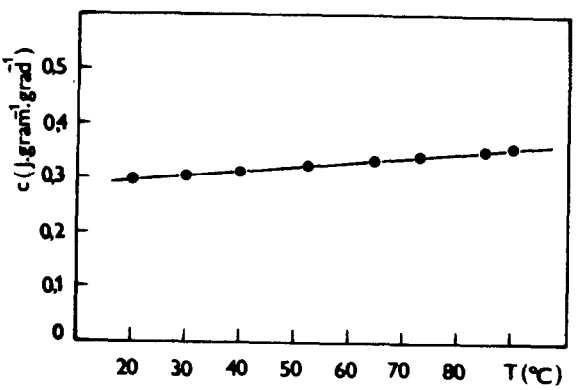


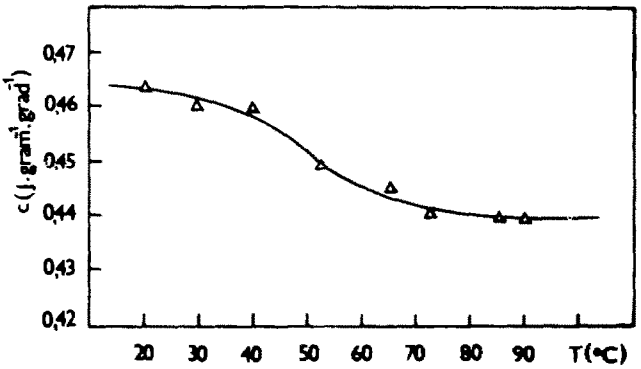
1. Thermal diffusivity of pure BaF_2



2. Thermal diffusivity of BaF_2 doped by 31 mol % LaF_3



3. Specific heat of pure BaF_2



4. Specific heat of BaF_2 doped by 31 mol % LaF_3

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