

being solved by L. V. Keldysh independently of this work, and we hope to be able to compare soon our results with his calculation.

ON THE SIGN OF THE CHANGE OF THE CHARGE RADIUS OF THE Sn^{119} NUCLEUS

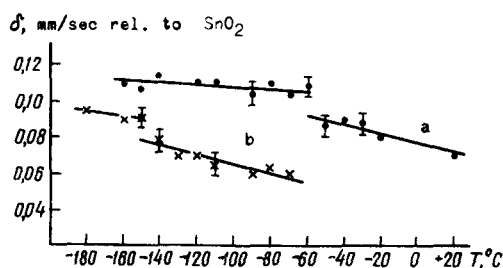
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It was found in [1,2], as a result of an analysis of the experimental data on the chemical shifts (δ) in Mossbauer absorption spectra of tetrahalogenides of tin, that the relative change of the charge radius of Sn^{119} on going from the ground state to the first-excited state is positive, i.e., $\Delta R/R > 0$.

A more careful analysis of the sign of the change of the Sn^{119} charge radius [3-5] has shown later that the assumptions made in [1,2], namely that the compound SnF_4 is 100% ionic and that a decisive influence on the electron density in the nucleus is exerted only by the external S electrons, is apparently unfounded. The authors have then concluded on the basis of the data on the tetrahalogenides of tin that $\Delta R/R < 0$ for Sn^{119} .

We used the nuclear-gamma-resonance spectroscopy method to investigate the behavior of $\text{Ba}(\text{Ti}, \text{Sn})\text{O}_3$ solid solutions in the region of transition from the paraelectric into the ferroelectric state. From an analysis of the data on the temperature dependence of the chemical shift in the absorption spectra of such solid solutions in the transition region, and from a comparison with similar data for $\text{Ba}(\text{Ti}, \text{Fe})\text{O}_3$ [6], conclusions can likewise be drawn concerning the sign of the change in the charge radius of Sn^{119} .

The investigation was made with the apparatus described in the paper of Krizhanskii and Kruglov [7]. The source was tin dioxide. The absorber temperature was varied from room temperature to -170°C and was maintained within $\pm 1^\circ\text{C}$ during the experiment.



Shift of center of gravity of resonance-absorption line vs. temperature:

- a -- $\text{Ba}(\text{Ti}_{0.8}, \text{Sn}_{0.2})\text{O}_3$,
- b -- $\text{Ba}(\text{Ti}_{0.7}, \text{Sn}_{0.3})\text{O}_3$.

The temperature dependence of the chemical shift in the spectra of the investigated compounds is shown in the figure. At temperatures above -60°C (a) and -150°C (b) the corresponding solid solutions are in the paraelectric phase, which belongs to the cubic central-symmetry point group $m\bar{3}m$ (perovskite-type structure). In this phase the shift of the center of gravity of the absorption line varies linearly with the temperature, with a slope $(3.0 \pm 1) \times 10^{-4}$ (mm/sec)/deg. This dependence can be readily attributed to the temperature shift due to the quadratic Doppler effect.

However, at temperatures -60°C (a) and -150°C (b) a discontinuity sets in and a jump occurs in the value of the chemical shift. The presence of jumps in the temperature dependence of δ

can not be attributed to the temperature shift and must be interpreted as the consequence of structure (phase) changes in the investigated sample.

In our case the change of the chemical shift can be due to distortion of the unit cell and the concomitant change of length and angles of the bonds in the ferroelectric phase transition [8].

The data for Ba(Ti, Fe)O₃ (which also has a perovskite structure) show that the structure changes on going to the ferroelectric phase lead to an increase in the electron density on the Fe nucleus.

Inasmuch as in both cases the character of the lattice distortion is determined by the main component BaTiO₃, and the BaFeO₃ and BaSnO₃ are only a small fraction of the solid solution, it can be assumed that during the ferroelectric transition an increase of the electron density occurs also at the Sn¹¹⁹ nucleus. It is seen from the figure that the transition from the paraelectric into the ferroelectric phase is accompanied by an increase (relative to SnO₂) in the chemical shift of the absorption line. It then follows from the formula

$$\delta = \text{const.} \cdot \left\{ |\psi(0)|_{\text{abs}}^2 - |\psi(0)|_{\text{source}}^2 \right\} \frac{\Delta R}{R}$$

that $\Delta R/R < 0$ for Sn¹¹⁹, in accord with [3-5].

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ERRATA

Vol 3, No. 1, p. 26

Article by V. S. Bogdanov, "Jump in Volume and Melting Curve of Cesium at Pressures up to 17,000 kg/cm²," in line 2 of the second paragraph "jump of volume along the melting point" should read "jump in volume along the melting curve."

Vol. 3, No. 2, p. 28

Article by B. T. Geilikman and V. Z. Kresin, "Jump in Specific Heat on Going from the