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* L. M. Livshitz took part in the construction and adjustment of the instrument.

INTERACTION OF IMPURITY TIN IN TRANSITION-METAL MATRICES

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Even in the early investigations in which the Mossbauer effect was used to determine the isomer shifts of impurity tin nuclei in metallic systems it was assumed unconditionally that these quantities are connected with the electronic properties of the investigated objects. So far, however, no definite correlation was found between the isomer shifts and the properties of the band structure of the investigated systems. Furthermore, if the content of the Sn^{119m} impurity atoms is ~1 at.%, it is not clear as yet whether they should be regarded as isolated or whether their interaction with one another is already sufficiently large at this concentration.

To ascertain the nature of the isomer shift of impurity tin nuclei in normal metals, we determined these quantities for Pb, In, Cd, Cu, Ag, and Au matrices containing from 0.02 to 1 at.% radioactive Sn^{119m}. The samples were prepared by fusing the investigated metal with 1 at.% of Sn^{119m} in an evacuated quartz ampoule. The metal purity was not worse than 99.999%, with the exception of Ag, where the purity was 99.99%. Smaller Sn^{119m} concentrations were obtained by diluting the alloy. The prepared alloys were rolled into foil and annealed in vacuum for two hours. The samples served as the γ-quantum sources, and the absorber was magnesium stannide. The source and absorber were kept at liquid-nitrogen temperature. The spectra were plotted with a mechanical setup at constant speed. The spectra were singlet and their half-width was not determined precisely. The results are shown in the
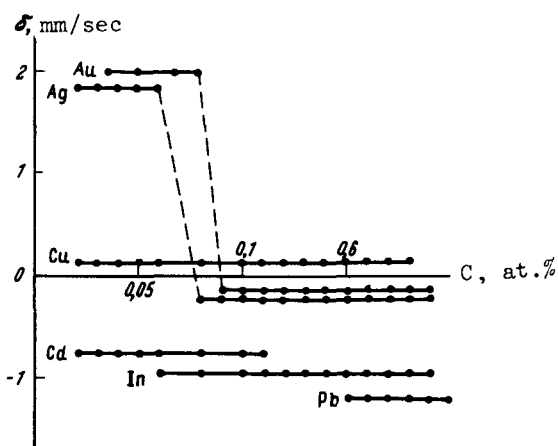
Isomer shift of Sn^{119m} nuclei relative to Mg_2Sn in Au, Ag, Cd, In, Pb, and Cu matrices as a function of the tin density C. The shift values were determined accurate to ±0.02 mm/sec.

figure. An unexpected behavior of the shift was observed in the case of Ag and Au, and at low tin concentrations (up to 0.06 at.% for Ag and up to 0.08 at.% for Au) the shifts were

independent of the impurity concentration and were equal respectively to +1.85 and +2.0 mm/sec, followed by a sharp drop and again a region where the shift stayed constant with varying tin concentration.

According to the theory of Blandin and Daniel [1], the change of the charge density around the impurity nuclei and the matrix nuclei in dilute solid solutions should be proportional to the concentration and should have the same sign. As shown by data on the Knight shift, this rule is satisfied in the main for impurity concentrations up to several per cent [2-4]. However, in the case of small impurity concentrations in Ag ($<$ 1 at.%) the values of the Knight shift for Ag^{109} nuclei did not fit the linear dependence on the concentration, and the line shape was asymmetrical. It may be that the anomalous behavior of the isomer shift of the Sn^{119} impurity nuclei and of the Knight shift of the Ag matrix nuclei have a common cause. A possible cause of such a jumplike behavior of the isomer shift may be a transition from bound states to band states, or in other words, a change in the structure of the alloy (for example, a transition from a fully disordered alloy to an ordered one). The latter is quite possible, since the valence difference ΔZ between the impurity and the matrix is positive, thus contributing to ordering of the impurity, and the same data on the Knight shift of the nuclei Sn^{119} and Ag^{107} in dilute alloys with Ag base indicate that the Sn atoms have a tendency to become ordered.

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PHONON DRAGGING IN BISMUTH

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The interaction between electrons and phonons in a crystal causes not only mutual scattering, but also dragging, an effect that becomes manifest in a strong increase of the thermal emf and of the Nernst effect.* The conditions become particularly favorable for dragging in nondegenerate semiconductors, where the phonon components of these kinetic phenomena can exceed the diffusion ones by hundreds or even thousands of times [1,2].

A. L. Natadze and A. L. Efros [3] and L. E. Gurevich and I. Ya. Korenblit [4] have pointed out in their theoretical papers that favorable conditions for the appearance of dragging exist at low temperatures in such a semimetal as bismuth. According to the theoretical estimates, dragging should cause vanishing of the small factors $k_0 T/\zeta \ll 1$ in the formulas for the differential thermal emf α and the Nernst coefficient Q of a degenerate electron gas

$$\alpha \approx \frac{k_0}{e} \frac{k_0 T}{\zeta},$$ (1)

$$Q \approx \frac{k_0}{e} \frac{u}{c} \frac{k_0 T}{\zeta}$$ (2)