We have also investigated paramagnetic resonance in lithium alloys. The alloying components used were Na, K, Hg, Pb and Wood's alloy.

The effect of the alkali metals Na and K on paramagnetic resonance in lithium is just as weak as in the case of sodium. However, even 0.001% of a heavy component such as Hg, Pb, or Wood's alloy broaden the line to such an extent that it becomes impossible to observe absorption in these alloys. We offer no quantitative data on these alloys, because the purity of the original lithium was only 98%. Furthermore, lithium alloys very poorly with sodium or potassium.[7]

Our results agree with Elliot's theory,[8] from which it follows that impurity metals with strong spin-orbit interaction greatly shorten the spin-lattice relaxation time. This results in such a broadening of the lines in the Li and Na alloys with insignificant admixtures of heavy metals. On the other hand, the alkali metals (Li, Na and K) have relatively weak spin-orbit interactions and therefore have a weak influence on the width ΔH.

The shift of the g-factor of the line can be used as a measure of the spin-orbit interaction of the impurity atoms. We propose to conduct measurements of g-factors at 10,000 Mcs in alloys with smaller metal-particle dimensions. We also plan to measure the Knight shift for the resonance lines of Na^{23} and Li^{7}. These experiments will permit a detailed comparison with the theory.

In conclusion, the authors express their gratitude to K. A. Valiev for his review of the results.

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THE FIRST EXCITED STATE OF Tb^{159}

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In a scintillation-spectrometer study of the γ radiation of Dy^{159}, which decays entirely via K capture, a weak line at twice the energy was observed in the pulse distribution in addition to the K radiation of Tb^{159} (44.5 kev). Measurements with varying distances from source to crystal, and using filters showed that this line is the result of full summing of 44.5-kev quanta. For the 1.5-microsec resolving time of our apparatus (a 128-channel analyzer[1]), the chance-coincidence rate would be two orders of magnitude smaller than that actually observed in the sum peak. From this one is naturally led to the assumption that the observed 90-kev line is the result of summing two cascade quanta of half the energy, the first of which is the K radiation of Tb^{159} after K capture, while the second is the result of decay of the first excited state of Tb^{159}.

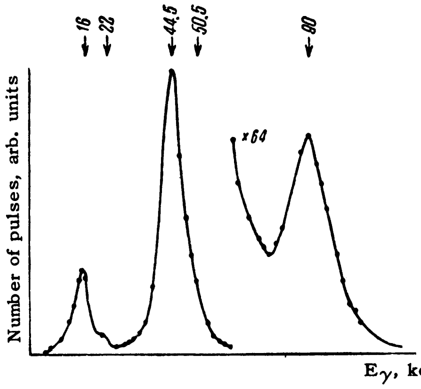

FIG. 1. γ spectrum of Dy^{159}, using NaI (Tl) crystal. The 16-kev peak is due to K_α radiation of iodine, the 22-kev peak to K_β radiation of iodine.

A suggested value of the energy of the first excited state of Tb^{159} (57.5 kev) was given on the basis of Coulomb excitation of Tb.[2] The conversion electrons corresponding to this excited state have been observed.[3] Gamma rays from deexcitation of this state have never been observed. Our experiments show that if such a line does exist, its intensity does not exceed 1% of the 44.5-kev peak.

An additional check was made using a "sum" spectrometer with a CsI (Tl) crystal (diameter

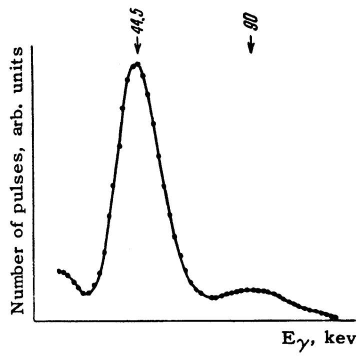

FIG. 2. γ spectrum of Dy^{159} taken with a sum spectrometer.

50 mm, h = 20 mm). The pulse distribution is shown in Fig. 2. A computation of the efficiency from the areas of the main and sum peaks,[4] on the assumption that the latter is produced by the same number of 44.5-kev quanta in cascade, is in good agreement with the efficiency computed by an independent method.

Thus the deexcitation of the first excited state of Tb^{159} also occurs with emission of Tb K radiation, in view of the strong conversion of the 57.5-kev line. The conversion coefficient is $\geq 99\%$.

In conclusion the authors thank A. N. Murin and B. K. Preobrazhenskii for their preparation of the pure source.

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STUDY OF γ-RAYS FROM As^{78} *DECAY*

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It is known that in the decay of As^{78} (T = 90 min) two groups of β^- particles are emitted (E_β = 4.1 Mev, 70% branch; E_β = 1.4 Mev, 30%). γ rays with energies of 0.27 Mev[1] and 0.615 Mev[2] are also observed in the decay. It is impossible, on the basis of the available data, to attempt even a decay scheme for this isotope.

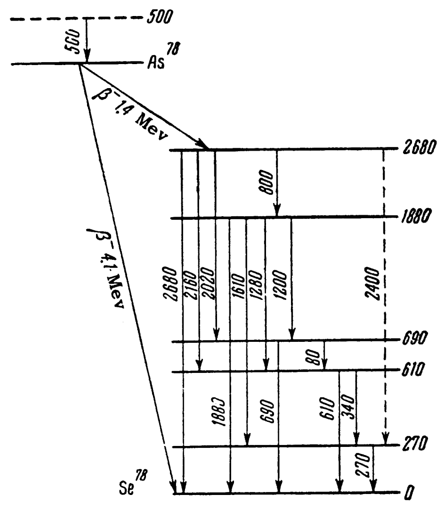
We obtained As^{78} from bombardment of separated Se^{78} isotope with 14-Mev neutrons, via the (np) reaction.

The measurements were carried out on a scintillation spectrometer with a 128-channel analyzer.[3] We used the geometry of the standard single-crystal spectrometer (with FEU-S photomultiplier and a NaI(Tl) crystal, diameter 30 mm, h = 40 mm), and the geometry of a 4π summing spectrometer (FEU-13 with CsI(Tl) crystal, diameter 50 mm, h $\doteq$ 40 mm).

The following γ lines were observed in the singles spectrometer geometry: 500 kev with T = 5 to 6 min; γ lines with T = 90 ± 10 min: 270, 610, 800, 1280, 2680 kev (all intense lines), 80, 345, 690, 1200, 1620, 1880, 2020, and 2160 kev (weak lines). There was a suspicion of the existence of a line with very low intensity at ~ 2400 kev.

In the summing spectrometer geometry, the following sum lines were definitely observed (all with period 90 ± 10 min): 420, 2700, and 1650 kev. The transitions with a period of 90 min can be assigned to the $As^{78} \rightarrow Se^{78}$ β^- decay.

The γ line at 500 kev (T = 5 to 6 min) is interesting. It is not the result of annihilation of positrons from some β^+ decay, since careful measurements with the summing spectrometer showed no sum line at E_γ = 1 Mev. We also observed no other γ lines with T = 5 to 6 min. This suggests that this line is the result of deexcitation of some metastable state which is formed in the interaction of neutrons with Se^{78}



Decay Scheme of As^{78}.