We are continuing this work and the final results and analysis will be reported later.

The authors are grateful to L. I. Krasnoslobodtseva for help in the scanning of photographs.

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*The internal conversion coefficients of reference 8 were obtained by using the value P = 0.94 ± 0.20 for the Panofsky ratio. If one accepts the value[9] P = 1.15 – 1.9 then the internal conversion coefficients derived from the data of reference 8 are in disagreement with other experiments and with theory.

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## *MEASUREMENT OF THE POLARIZATION OF INTERNAL CONVERSION ELECTRONS**

V. A. LIUBIMOV and M. E. VISHNEVSKII

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As a consequence of parity nonconservation in $\beta$ decay, the daughter nucleus is polarized along the direction of emission of the $\beta$ electron. Consequently, the conversion electrons resulting from the internal conversion process following $\beta$ decay will have definite polarization related to the direction of emission of the $\beta$ electron.

Formulas for this polarization were obtained by Berestetskii and Rudik[2] and by Geshkenbein.[3] It follows from these formulas that the polarization of conversion electrons depends on the same combination of coupling constants and matrix elements as the angular distribution of electrons from $\beta$ decay of oriented nuclei.

We report here on the results of measurement of the polarization of internal conversion electrons following the $\beta$ decay of $\mathrm{Hg}^{203}$ $\left(? \xrightarrow{\beta} 3/2 + \xrightarrow{e_K} 1/2 +\right)$. The $\beta$ electrons were registered by counters 1 and 2. The conversion electrons, emitted at an angle of 90° with respect to the $\beta$ electrons, were registered by counters 3 and 4 after passing through a system of magnetic lenses and undergoing scattering through an angle of 125° from a scatterer. The axis of counters 3 and 4 was at an angle of $\pi/2$ with respect to the axis of counters 1 and 2. Amplitude discrimination and the tuning of the spectrometer to the energy of the conversion electrons were used to distinguish the conversion electrons from the $\beta$ electrons. Counters 3 and 4 were wired in coincidence with counters 1 and 2. The setup was such that $\beta$-$e_K$ coincidences were registered separately in counters 1 and 3, 1 and 4, 2 and 3, and 2 and 4.

If the conversion electrons are transversely polarized parallel (or antiparallel) to the direction of emission of the $\beta$ electrons, then one should observe, in the single scattering by a heavy element thin scatterer, azimuthal asymmetry in the direction of counters 3 and 4, which, in the absence of asymmetries in the apparatus, equals $N_{13}/N_{14} = N_{24}/N_{23} = \alpha < 1$ (or $> 1$). Here $N_{ik}$ stands for the number of coincidences in counters i and k after subtraction of the background due to accidental coincidences.

The azimuthal asymmetry of the conversion electrons scattered by gold (0.4 mg/cm$^2$) was found to be

$$\alpha_{\mathrm{Au}} = \sqrt{\frac{N_{13}}{N_{14}}\frac{N_{24}}{N_{23}}} = 1.11 \pm 0.04.$$

The asymmetry inherent in the apparatus was found by using aluminum as a scatterer, which should yield practically no azimuthal asymmetry due to the electron polarization: $\alpha_{\mathrm{Al}} = 0.97 \pm 0.03$. Thus, correcting for apparatus asymmetry, we find

$$\alpha = \alpha_{\mathrm{Au}} / \alpha_{\mathrm{Al}} = 1.15 \pm 0.05.$$

Taking into account the finite thickness of the scatterer yields $\alpha_{\mathrm{corr}} = 1.21 \pm 0.07$. Consequently, conversion electrons resulting after the $\beta$ decay of $\mathrm{Hg}^{203}$ are polarized antiparallel to the direction of emission of the $\beta$-electrons.

The spin and parity of the ground state of $\mathrm{Hg}^{203}$ are unknown. Since, however, the value $\ln(ft) = 6.4$ is not large it is to be expected that the spin of the ground state of $\mathrm{Hg}^{203}$ will not differ by more than unity from the spin of the excited state of $\mathrm{Tl}^{203}$, the daughter nucleus in the $\beta$ decay.

If one assumes that the $\beta$-interaction coupling constants satisfy the relations $C_S = -C'_S$, $C_T = -C'_T$, $C_V = C'_V$, $C_A = C'_A$, as established in the experiments on the polarization of $\beta$-electrons,[4] then the value of $\alpha$ to be expected for a spin assignment of $5/2^{\pm}$, $3/2^{\pm}$, $1/2^{\pm}$ for the ground state of $\mathrm{Hg}^{203}$ is $\alpha_{5/2} = 0.87$, $\alpha_{3/2} = 0.95$ to $1.15$, $\alpha_{1/2} = 1.25$ for electrons of average energy $\sim 100$ kev.

The results of the measurement indicate with a large probability that the ground state of $\mathrm{Hg}^{203}$ has spin $1/2$, and disagree with the spin $5/2$ assignment. Consequently, the absence of a direct $\beta$ transition from $\mathrm{Hg}^{203}$ to the ground state of $\mathrm{Tl}^{203}$ with spin $1/2^{+}$ cannot be explained as spin forbidden.

In conclusion we express our gratitude to Academician A. I. Alikhanov for his interest in this work.

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# *ANTIFERROMAGNETISM OF THE GAMMA PHASE OF IRON*

E. I. KONDORSKII and V. L. SEDOV

Moscow State University

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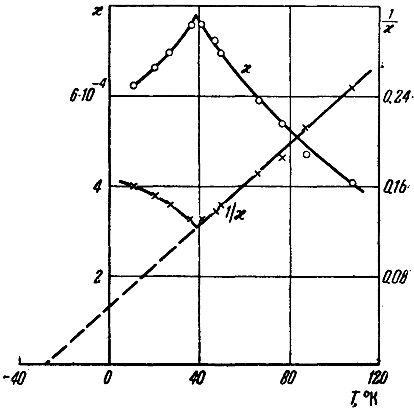
It is known that the magnetic susceptibility of the $\alpha$ phase (volume-centered cubic lattice) of iron obeys the Curie-Weiss law, $\kappa(T - \Theta) = C$, at temperatures above the Curie point (770°C). It is also known that the susceptibility of the $\gamma$ phase (face-centered cubic lattice) of iron also obeys the Curie-Weiss law in the temperature range (910 to 1400°C) in which this phase is stable, but with different values of the parameters $C$ and $\Theta$. It is therefore interesting to determine whether the $\gamma$ phase of iron is ferromagnetic or antiferromagnetic at low temperatures, if a $\gamma \rightarrow \alpha$ transition is effected by introducing alloying additives and suitable heat treatment.

We investigated the temperature dependence of the magnetic susceptibility of austenitic steel in the temperature interval from 109 to 11.3°K. The investigated specimen contained 18% Cr and 9% Ni. The specific susceptibility $\kappa$ was measured by a procedure previously described by the authors.[1]



The measurement results are shown in the diagram. As can be seen from the plot, there is a clearly pronounced antiferromagnetic transformation near 40°K. The value of the paramagnetic Curie point $\Theta_p$ is $(28 \pm 3)$°K. The results obtained give grounds for assuming that in a face-centered lattice of iron the exchange interactions would lead to antiferromagnetism at low temperatures, the same as in the neighboring elements manganese[2,3] and chrome.[4]

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