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

The spin and parity of the ground state of 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 Hg^{203} will not differ by more than unity from the spin of the excited state of Tl^{203}, the daughter nucleus in the β decay.

If one assumes that the β-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 β-electrons,[4] then the value of α to be expected for a spin assignment of $5/2^{\pm}$, $3/2^{\pm}$, $1/2^{\pm}$ for the ground state of 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 ~ 100 kev.

The results of the measurement indicate with a large probability that the ground state of Hg^{203} has spin $1/2$, and disagree with the spin $5/2$ assignment. Consequently, the absence of a direct β transition from Hg^{203} to the ground state of 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

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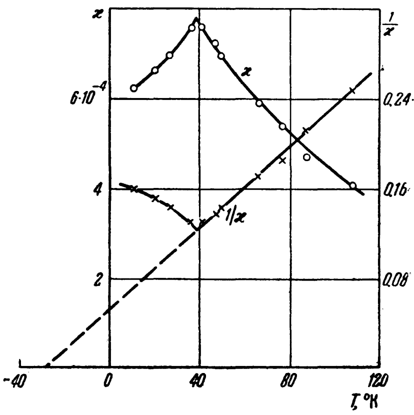
IT is known that the magnetic susceptibility of the α phase (volume-centered cubic lattice) of iron obeys the Curie-Weiss law, $\kappa(T-\Theta) = C$, at temperatures above the Curie point (770°C). It is also known that the susceptibility of the γ phase (face-centered cubic lattice) of iron also obeys 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 Θ. It is therefore interesting to determine whether the γ 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 κ 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 Θ_p is (28 ± 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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ON THE PROBLEM OF TESTING THE INVARIANCE OF AN INTERACTION UNDER TIME REVERSAL

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THE discovery of the noninvariance of the weak interactions under space inversion and charge conjugation has greatly increased interest in a more detailed study of the symmetry properties of the strong interactions. In the present note we point out the possibility of a direct experimental test of the invariance of various interactions under time reversal, based on the relations between polarization phenomena in inverse reactions.[1-5] Until recently such tests were based on the ratio of the cross-sections of inverse reactions averaged over the spins,[6] and for the weak interactions on a number of consequences arising from the reality (or purely imaginary nature) of the interaction constants. Very recently it has been proposed[7,8] that the symmetry of strong interactions under time reversal be studied by examining the equality of the polarization and asymmetry in elastic scattering.[9,10] On the basis of the results of references 1 to 5, analogous tests can be carried out with various nuclear reactions. For example, the polarization of the neutron in the reaction $d + d \rightarrow n + He^3$, with the deuterons unpolarized, agrees, within the usual factor appearing in the balance relations, with the asymmetry in the cross-section of the inverse reaction $n + He^3 \rightarrow d + d$ with polarized neutrons. An examination of the relation between the polarization and the asymmetry, and of more complicated relations, would be a test of the invariance of the interaction under time reversal, since it is known that parity is very precisely conserved in the strong interactions of ordinary particles.[11] For this same purpose one can also use the reaction $p + T \rightleftharpoons n + He^3$. And in general, by looking at a table of nuclear reactions, one can pick out many other reactions that can be used for this purpose.

For the reactions involving γ-ray quanta we can look at the photodisintegration of the deuteron and the radiative capture of a neutron by a proton:

$$n + p \rightleftarrows d + \gamma. \qquad (1)$$

Here, in addition to the relations that hold, for example, between the polarization of the neutron from the photodisintegration of the deuteron and the asymmetry in the cross-section for radiative capture of polarized neutrons by protons, one can make a comparison of the polarization of the photons from the radiative capture and the asymmetry of the photodisintegration cross section with polarized γ radiation.

For studying the time reversibility of processes of pion production we can take the reaction

$$p + p \leftrightarrows d + \pi^+, \qquad (2)$$

which has been studied in detail in reference 1. Recent experiments[12,13] can be regarded as the first stage of such a test. The results of Neganov and Parfenov show that the relations between the unpolarized cross-sections are satisfied to within 10 to 15 percent, which agrees with the estimates of Henley and Jacobsohn,[6] which were based on different experimental data.

For the study of the symmetry of interactions involving strange particles we can consider the reaction

$$K^- + d \rightleftarrows \Sigma^- + p, \qquad (3)$$

which Lee once proposed for the determination of the spins of the particles,[14] and also a number of similar reactions.[15] The polarization of the Σ^-, which one can hope to detect from the asymmetry of its decay, must agree with the asymmetry of the K^- in the reaction $\Sigma^- + p \rightarrow d + K^-$ with the Σ^- polarized (for example, by the process that produces it). The study of the polarization phenomena in the reaction (3) can also help to settle the question as to whether there is a connection between the small asymmetry in the decay of the Σ^- from the reaction $\pi + N \rightarrow \Sigma^- + K$ and threshold effects.

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