lation coefficients between the directions of rays and the number of narrow pairs in nuclear disintegrations. Using the table of random stars it is possible to obtain the theoretical values of these quantities. The number of pairs with angle $\leq 2°$ (see Fig. 3) was equal to four in 200 stars. This is close to the quantity obtained in reference 6. The Q values (see reference 6, Table I, last line) connected with the correlation coefficients were, respectively, 0.32 ± 0.06, and 0.00 ± 0.07. A more detailed analysis of the correlations showed that as the number of rays in the stars increased, the statistical dependence between the directions of the rays becomes more obvious. This is connected with an increase of the limits placed on the directions of the particles by the law of conservation of momentum.

These results from the formation of the table of random stars testifies to the usefulness of this method for analyzing various details of the process of multiple production.

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TEMPERATURE DEPENDENCE OF FERROMAGNETIC RESONANCE IN YTTRIUM FERRITE-GARNETS

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THERE have hitherto been few data on the temperature dependence of ferromagnetic resonance in ferrites. Meanwhile, the study of this dependence has acquired considerable importance, because it is here that the relation between the resonance characteristics and the magnetic properties of a ferrite is manifested most clearly. The present communication presents the results of a study of the temperature dependence of the width of the ferromagnetic resonance absorption line, the g-factor, and the resonance field in polycrystalline yttrium ferrite-garnets, in which the Fe^{3+} ions have been partly replaced by Al^{3+} and Cr^{3+} ions. At the same time, measurements of the temperature dependence of the spontaneous magnetization were made by a method described earlier.[1]

Figure 1 shows the temperature dependence of the absorption line width (solid curves) and of the specific spontaneous magnetization (dashed curves) of yttrium ferrite-garnets of the following compositions: $3Y_2O_3 \cdot 5Fe_2O_3$ (1); $3Y_2O_3 \cdot 4Fe_2O_3 \cdot Al_2O_3$ (3); $3Y_2O_3 \cdot 4.5Fe_2O_3 \cdot 0.5Cr_2O_3$ (2). Because of the small density of the specimens, the width of the resonance line was quite large; this permitted a clearer exhibition of its change on heating. It is clear from Fig. 1 that the decrease of spontaneous magnetization on approach to the Curie point occurs more abruptly than does the decrease of ΔH. It should furthermore be noted that the decrease of σ_S and of ΔH proceeds more rapidly in the case of the stoichiometric ferrite $3Y_2O_3 \cdot 5Fe_2O_3$ than it does for the "substituted" ferrites. The greater the Al^{3+} and Cr^{3+} content, the more slanting the ΔH and σ_S

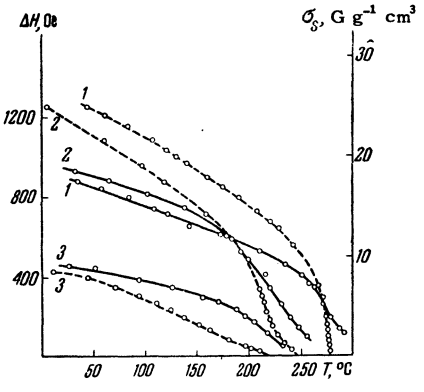

FIG. 1. Temperature dependence of the width ΔH of the ferromagnetic resonance absorption line (solid curves) and of the specific spontaneous magnetization σ, (dashed curves): 1) for $3Y_2O_3 \cdot 5Fe_2O_3$; 2) for $3Y_2O_3 \cdot 4.5Fe_2O_3 \cdot 0.5Cr_2O_3$; 3) for $3Y_2O_3 \cdot 4Fe_2O_3 \cdot Al_2O_3$.

curves are in comparison with the curves for $3Y_2O_3 \cdot 5Fe_2O_3$. Probably the Al^{3+} and Cr^{3+} ions are distributed nonuniformly in the ferrite-garnet lattice, as a result of which there occur fluctuations of the exchange interactions through the volume of the specimen; these in turn lead to a "washing out" of the curves of ΔH and σ_S vs temperature. According to the theory of Clogston, Suhl, et al.,[2] the value of ΔH in ferrites should be proportional to $\sqrt{\sigma_S}$. As can be seen from Fig. 2, this

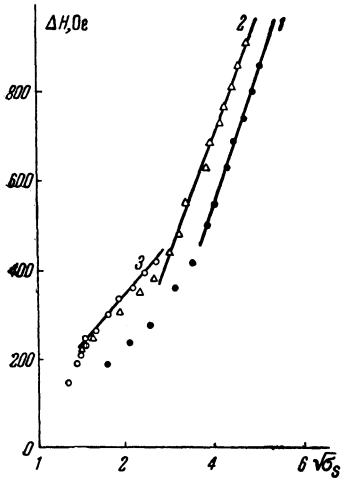

FIG. 2. Dependence of ΔH on $\sqrt{\sigma_s}$ for ferrite-garnets, calculated from the curves of Fig. 1 (same materials and same notation for them).

relation is satisfied qualitiatively in a certain temperature interval (far from the Curie point).

Figure 3 shows the temperature dependence of

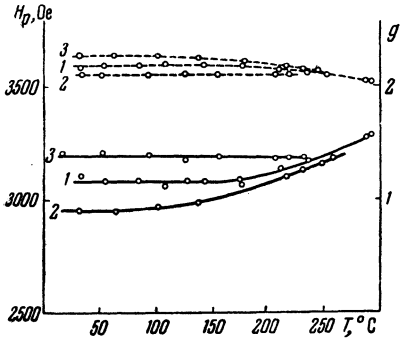

FIG. 3. Temperature dependence of resonance field H_p (solid curves) and of g-factor (dashed curves) for the same materials as in Fig. 1.

the resonance field H_p and of the g-factor on temperature. It is interesting to note that in the stoichiometric ferrite $3Y_2O_3 \cdot 5Fe_2O_3$ and in $3Y_2O_3 \cdot 4.5Fe_2O_3 \cdot 0.5Cr_2O_3$, H_p increases on approach to the Curie point, whereas the g-factor decreases slightly.

This work was performed under the direction of K. P. Belov.

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MAGNETIC AND RESONANCE PROPERTIES OF YTTRIUM FERRITE-GARNETS WITH REPLACEMENT OF Fe^{3+} *IONS BY* Cr^{3+} *AND* Al^{3+} *IONS*

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RECENTLY there has been great interest in the investigation of ferromagnetic resonance in new magnetic materials, ferrite-garnets of the rare-earth elements and of yttrium.[1,2] In the present communication we give the results of our experiments on the effect of replacement of Fe^{3+} ions by Al^{3+} and Cr^{3+} ions, in the stoichiometric yttrium ferrite-garnet $3Y_2O_3 \cdot 5Fe_2O_3$, upon the magnetic and resonance properties of this ferrite. Upon replacement of a corresponding quantity of Fe^{3+} ions by Al^{3+} and Cr^{3+}, the formulas for the ferrites studied will have the form:

$$3Y_2O_3 \cdot (5-a)\,Fe_2O_3 \cdot a\,Al_2O_3;\quad 3Y_2O_3 \cdot (5-a)\,Fe_2O_3 \cdot aCr_2O_3.$$

Here a is the content of Al^{3+} or Cr^{3+} ions per mole. The measurements of magnetic and resonance characteristics were carried out on polycrystalline specimens, prepared in accordance with standard ceramic technology (sintering at 1300° C in air for four hours). The density of the specimens was no greater than 2.75 g/cm^3; this led to a pronounced broadening of the ferromagnetic resonance absorption line. In our experiments this was an advantage, since it permitted a clear exhibition of the effect of the introduction of Al^{3+} and Cr^{3+} ions into the ferrite upon the absorption line width. For all the specimens, isotherms of the magnetization were taken by a ballistic method at helium temperatures; from these the saturation magnetization σ_0 was found, in Bohr magnetons per mole.

Replacement of Fe^{3+} ions by Al^{3+} ions (which have no magnetic moment) causes a decrease in the value of σ_0 (Fig. 1), whereas replacement by Cr^{3+} ions at first leads to an increase of σ_0; but