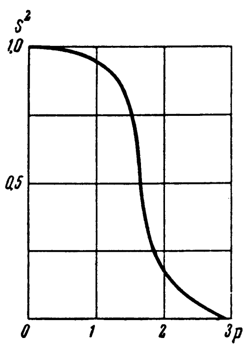

tained from the experimental data on the elastic scattering of nucleons by C^{12}, is shown in the figure.

In conclusion we express our deep gratitude to K. A. Ter-Martirosyan for valuable advice and constant assistance.

[1] G. F. Chew and F. E. Low, Phys. Rev. **113**, 1640 (1959).

[2] G. A. Leksin, On the Elastic Scattering of Nucleons by Nuclei, Preprint, Joint Inst. Nuc. Res., 1957.

Translated by R. Lipperheide
365

SINGLE CRYSTALS OF MAGNESIUM-MANGANESE FERRITES WITH A NARROW FERROMAGNETIC RESONANCE ABSORPTION CURVE

K. P. BELOV, V. F. BELOV, and A. A. POPOVA

Institute of Crystallography, Academy of Sciences, U.S.S.R.

Submitted to JETP editor March 18, 1960

J. Exptl. Theoret. Phys. (U.S.S.R.) **38**, 1908-1910 (June, 1960)

A considerable interest has been noted recently in investigations of ferrites with narrow ferromagnetic resonance-absorption lines.[1-4] This interest is caused by the fact that the ferrite crystals can be used in nonlinear microwave apparatus. Particular attention is paid here to the investigation of single crystals of yttrium ferrite with garnet structure.[1-3] It appears to us, however, that not all the possibilities of the spinel class of ferrites have been disclosed in this respect.

Our experiments have shown that in some ferrite systems with spinel structure one can encounter compositions with single crystals that have a sufficiently narrow ferromagnetic resonance absorption line. We have measured the width of the line ΔH in single crystals of magnesium-manganese ferrites for different ratios of the manganese and magnesium oxides. The single crystals were grown by the Verneil method and machined into spheres 0.8 — 1 mm in diameter. The surfaces of the spheres were polished by running in with air on emery cloth with $20.15\,\mu$ and $10\,\mu$ grains. The measurements were made in a short-circuited waveguide section at 9470 Mcs. The width of the line was determined from the resonance curve at the 0.5 level. In the single crystals of magnesium-manganese ferrites which we investigated, ΔH = 12 to 18 oe (see Table I).

The narrowest absorption line at the surface finish employed by us (which obviously is not the ultimate one) was observed in a single crystal of the ferrite 8.4 MgO, 23.9 MnO, 67.5 Fe_2O_3. This sample had $\Delta H = 12$ oe and $4\pi I_s = 2950$ gauss.

Figure 1 (solid curve) shows the results of measurements of the anisotropy of the width of the line for the single crystal of 6.9 MgO, 37.3 MnO, 55.9 Fe_2O_3 in the (110) plane at room temperature. It is seen that ΔH reaches a minimum along [100] (axis of difficult magnetization) and a maximum in the direction [111] (axis of easy magnetization). The amplitude of the anisotropy ΔH at room temperature amounts to (3.5 to 0.5) oe. The dotted curve in Fig. 1 shows the anisotropy of the resonant field H_r.

The character of the anisotropy of ΔH, established in our experiments, corresponds to the phenomenological calculation of Skrotskiĭ and Kurba-

TABLE I. Width of resonant absorption line ΔH, saturation magnetization $4\pi I_s$, and electric resistivity ρ in magnesium-manganese ferrites

Composition in percent by weight (calculated)	ΔH, oe	$4\pi I_s$, gauss	ρ, Ω·cm
9.4 MgO; 16.5 MnO; 74.1 Fe_2O_3	18	3320	800
8.4 MgO; 23.9 MnO; 67.5 Fe_2O_3	12	2950	$1.6\cdot10^5$
8.0 MgO; 28.3 MnO; 63.7 Fe_2O_3	16	2740	10^6
6.9 MgO; 37.3 MnO; 55.9 Fe_2O_3	18	2480	$4.6\cdot10^6$

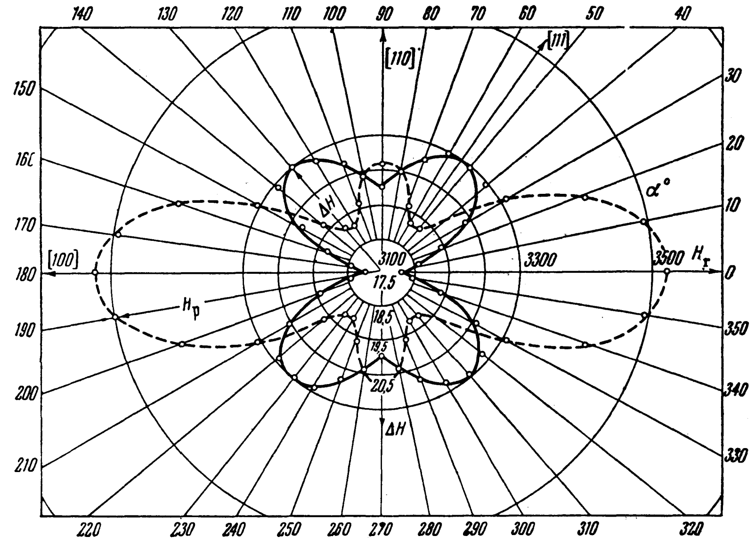

FIG. 1

tov.[5] It must be noted that in the interval from room temperature to +200° C the width of the resonance absorption line depends little on the temperature (see Fig. 2), whereas the constant of the magnetic crystallographic anisotropy, determined by the resonance method, is reduced by a factor of almost 20 in the same temperature interval.

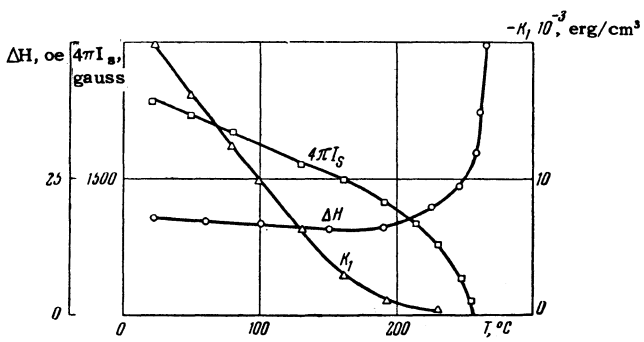

FIG. 2. Temperature dependence of the width ΔH of the line of ferromagnetic resonance absorption in the [100] direction, of the saturation magnetization $4\pi I_s$, and of the constant of magnetic anisotropy K_1, for the ferrite 6.9 MgO, 37.3 MnO, 55.9 Fe_2O_3.

The increase in ΔH in the region of the Curie point (Fig. 2) is apparently connected with the fluctuations of magnetization at the Curie point.

[1] J. F. Dillon, Phys. Rev. **111**, 6 (1958).

[2] Spencer, LeCraw, and Porter, J. Appl. Phys. **30**, 3 (1959).

[3] A. G. Gurevich and I. E. Gubler, Физика твердого тела, **1**, 1847 (1959), Soviet Phys.-Solid State Physics **1**, 1693 (1959).

[4] Fabrikov, Kudryavtsev, and Gushchina, Izv. Akad. Nauk SSSR Ser. Fiz. **23**, 372 (1959), Columbia Tech. Transl. p. 359.

[5] G. V. Skrotskiĭ and L. V. Kurbatov, JETP **35**, 216 (1958), Soviet Phys. JETP **8**, 148 (1959).

Translated by J. G. Adashko
366

ADDITIONAL ANOMALOUS LIGHT WAVES IN ANTHRACENE IN THE EXCITON ABSORPTION REGION

M. S. BRODIN and S. I. PEKAR

Institute of Physics, Academy of Sciences, Ukrainian S.S.R.

Submitted to JETP editor March 19, 1959

J. Exptl. Theoret. Phys. (U.S.S.R.) **38**, 1910-1912 (June, 1960)

ONE of the authors[1-3] predicted theoretically the existence of additional anomalous light waves in crystals in the region of exciton absorption. In our earlier paper[4] we proposed a method of experimentally proving the existence of these waves. The method reduces to a measurement of the intensity of monochromatic light, passing through a plane-parallel slab of crystal as a function of the thickness of the slab. The existence of two waves in a crystal is manifest in the interference of these waves as they leave the crystal. This interference