[3] L.A. Artsimovich, Zamknutye plazmennye konfiguratsii (Closed Plasma Configurations), Nauka, 1969. D.P. Ivanov and D.S. Perfenov, Paper C-21/144 at 2nd Internat. Conf. in Plasma Physics and Controlled Nuclear Fusion, Culham, 1965.

DOMAIN-WALL-CONNECTED NATURAL RESONANCE AT SUBMILLIMETER WAVELENGTH IN ORTHOFERRITES

G.A. Kraftmakher, V.V. Meriakri, and A.Ya. Chervonenkis
Institute of Radio Engineering and Electronics, USSR Academy of Sciences
Submitted 26 May 1971; resubmitted 8 July 1971
ZhETF Pis. Red. 14, No. 4, 231 - 233 (20 August 1971)

The use of a quasioptical spectrometer [1] revealed resonant absorption in $TmFeO_3$ at a wavelength λ = 0.77 mm in the absence of a magnetic field. The observations were made at room temperature.

The results reported below were obtained with a thulium orthoferrite sample in the form of a plate 5 × 5 × 1.2 mm cut perpendicular to the C axis. The dimension along the C axis was 1.2 mm.[1] The $TmFeO_3$ single crystal was grown by crucible-less zone melting with radiative heating [2].

To avoid diffraction losses in the quasioptical line, resulting from the fact that the crystal dimensions were smaller than the dimensions of the quasioptical beam, the $TmFeO_3$ sample was placed in a waveguide system matched to the quasioptical line with the aid of two horns.

Figure 1 shows the dependence of the coefficient T of transmission through the $TmFeO_3$ sample on the wavelength. The parameter of curves 1 - 4 is the longitudinal (parallel to the C axis) constant magnetic field H_0. We see from Fig. 1 that the wavelength at which resonant absorption takes place is practically independent of the value of H_0. The influence of H_0, unlike in [3], reduces only to a weakening of the resonant absorption.

We plotted in greater detail the dependence of the attenuation of the resonant absorption T_H/T on the magnitude and sign of H_0 for the resonant

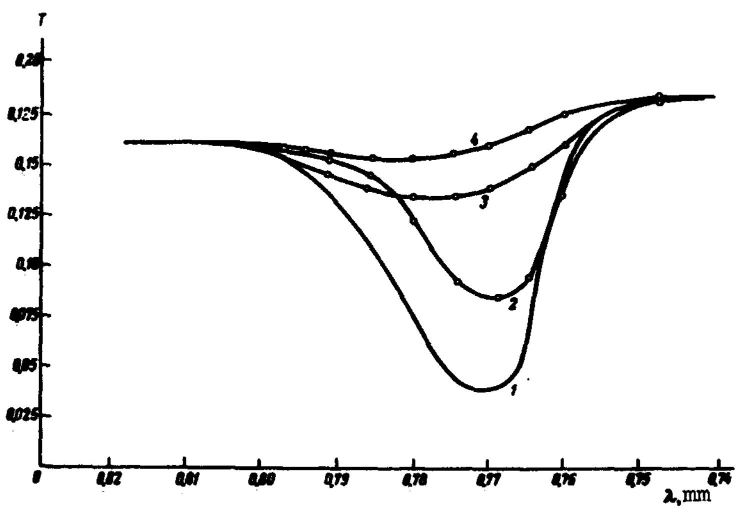

Fig. 1. Transmission coefficient T of $TmFeO_3$ vs. the wavelength λ: 1 - H_0 = 0, 2 - H_0 = -1400 Oe, 3 - H_0 = 100 Oe, 4 - H_0 = 1400 Oe.

[1] Analogous results were obtained with other $TmFeO_3$ samples, and also with dysprosium orthoferrite $DyFeO_3$.

wavelength $\lambda = 0.77$ mm (see Fig. 2), where T_H is the transmission coefficient in the presence of a magnetic field. We note that when even a weak longitudinal field is applied ($H_0 \sim 100$ Oe) the resonant absorption decreases by a factor 3.5, and application of $H_0 \sim 1400$ Oe makes the resonance almost unobservable.

An external field in the opposite direction exerts a smaller influence. No influence of the transverse field on the investigated resonance was observed.

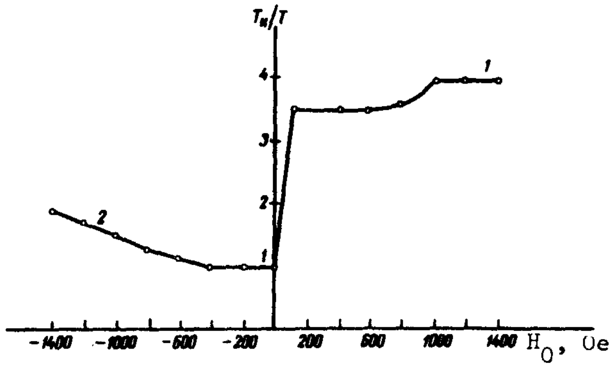

Fig. 2. Decrease of resonant absorption as a function of H_0 at $\lambda = 0.77$ mm.

It is interesting to note that the values of the fields leading to the vanishing of the resonance correspond to fields in which the domain structure vanishes and the orthoferrites become magnetized [4]. The asymmetry of curves 1 and 2 in Fig. 1 can be explained in analogy with the explanation used in [4] for the asymmetry of the hysteresis loops in orthoferrites.

Since the observed resonant absorption occurs only in the presence of a domain structure, it can be assumed that it is due to the interaction of the submillimeter radiation with the high-frequency vibrations in the domain walls. Such vibrations exist possibly alongside the low-frequency vibrations of the domain boundaries [5] in systems with two sublattices.

In conclusion, the authors thank Ya.M. Monosov for useful discussions.

[1] V.N. Apletalin, V.V. Meriakri, and E.E. Chigrai, Radiotekhnika i elektronika 15, 7 (1970).
[2] A.N. Balbashov, A.Ya. Chervonenkis, A.V. Antonov, and V.E. Bakhteuzov, Izv. AN SSSR, ser. fiz. 35, 1243 (1971).
[3] F.B. Hagedorn, E.M. Gyorgy, R.C. LeCraw, J.C. Hensel, and J.P. Remeika, Phys. Rev. Lett. 21, 364 (1968).
[4] Ya.S. Shur and V.I. Khrabrov, Zh. Eksp. Teor. Fiz. 57, 1899 (1969) [Sov. Phys.-JETP 30, 1027 (1970)].
[5] F.C. Rossol, J. Appl. Phys. 40, 1082 (1969).

MELTING CURVE OF MOLYBDENUM UP TO 90 KBAR

N.S. Fateeva and L.F. Vereshchagin
Institute of High-pressure Physics, USSR Academy of Sciences

Submitted 9 July 1971
ZhETF Pis. Red. 14, No. 4, 233 - 235 (20 August 1971)

In spite of the fact that molybdenum is one of the best known widely-used high-melting-point metals and one of the most important alloying elements, its melting curve has hitherto never been measured. This is due to the fact that traditional melting-temperature measurements with thermocouples, which ensure high measurement accuracies, become unsuitable because of melting of the thermocouple material. For this reason the melting temperature of molybdenum, even at atmospheric pressure, is known only accurate to ±50°C [1].

We deemed it interesting to measure the melting curve of molybdenum by an optical method. The apparatus and the procedure for the measurement of the temperatures and pressures were described by us in detail in earlier papers [2].