needed on the form factor of the pion.

In conclusion, we are grateful to the members of the Seminar of the Elementary-particle Theory Department of the Leningrad State University for an interesting discussion

[1] L. A. Khalfin, Yad. Fiz. 7, 876 (1968) [Sov. J. Nucl. Phys. 7 (1968)].
[2] L. A. Khalfin and Yu. P. Shchebrin, ZhETF Pis. Red. 8, 588(1968) [JETP Lett. 8, 360 (1968)].
[3] C. W. Akerlof et al., Phys. Rev. 163, 1482 (1967).
[4] V. L. Auslander et al., Phys. Lett. 25B, No. 6 (1967).
[5] R. Barrett et al., Preprint SLAC-POB-333.
[6] M. M. Block et al., Phys. Rev. 179, 1074 (1968).
[7] J. E. Bawcok and Th. Kannelopoulos, Nucl. Phys. B4, 417 (1968).
[8] J. G. Cordes and P. J. O'Donnel, Phys. Rev. Lett. 20, 1463 (1968).

NEW MAGNETIC TRANSFORMATION IN THE SYSTEM $Mn_2Ge_ySb_{1-y}$

A. A. Galkin, E. A. Zavadskii, and E. M. Morozov
Donets Physico-technical Institute, Ukrainian Academy of Sciences
Submitted 10 October 1968
ZhETF Pis. Red. 8, No. 11, 646-649 (5 December 1968)

The alloys of the system investigated here are a constituent part of the system $Mn_{2-x}A_xB_ySb_{1-y}$, where the element A can be Cr, Co, Cu, and V, and the element B - Ge, As, or In [1]. Basic to the entire system is the ferrimagnetic matrix Mn_2Sb. Introduction of the atoms A or B causes two first-order phase transitions to appear in the system when the temperature is varied: transition from the ferrimagnetic structure (FM) to the helical structure (H) and from the helical structure to the antiferromagnetic structure (AF). The indicated transitions were observed in the system $Mn_{2-x}Cr_xSb$ [2,3] and it can be assumed that they should be observed in the entire system $Mn_{2-x}A_xB_ySb_{1-y}$. For the system $Mn_2Ge_ySb_{1-y}$, the magnetic measurements were performed by us for the first time.

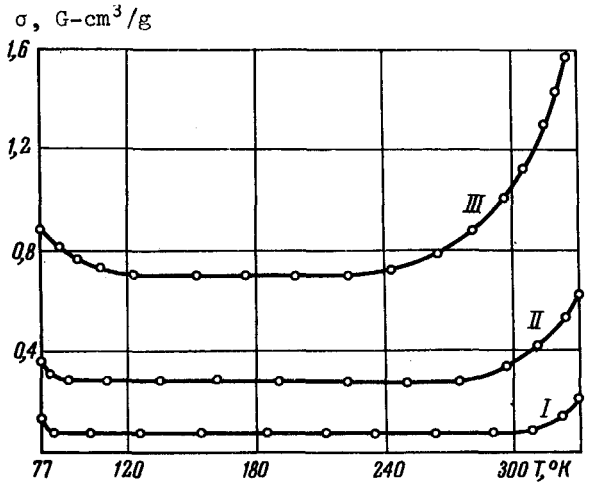

Fig. 1. Temperature dependence of the magnetization of polycrystalline $Mn_2Ge_{0.2}Sb_{0.8}$. Curve I corresponds to H = 17 kOe, II - 100 kOe, III - 240 kOe.

On the basis of the magnetic measurements in fields up to 300 kOe in the temperature interval 77 - 450°K, made on alloys of the system with y = 0.04, 0.08, 0.12, 0.16, and 0.20, we can draw the following conclusions:

1. When $0.08 < y < 0.19$, two magnetic transitions, AF-H and H-FM are observed with increasing temperature.

2. When $y \leq 0.08$, only the H-FM transition is observed, since the AF state is not realized in the employed temperature interval.

3. When $y > 0.19$, an AF-FM transition is observed, bypassing the helical state.

Besides the indicated transitions, the existence of which can be assumed in analogy

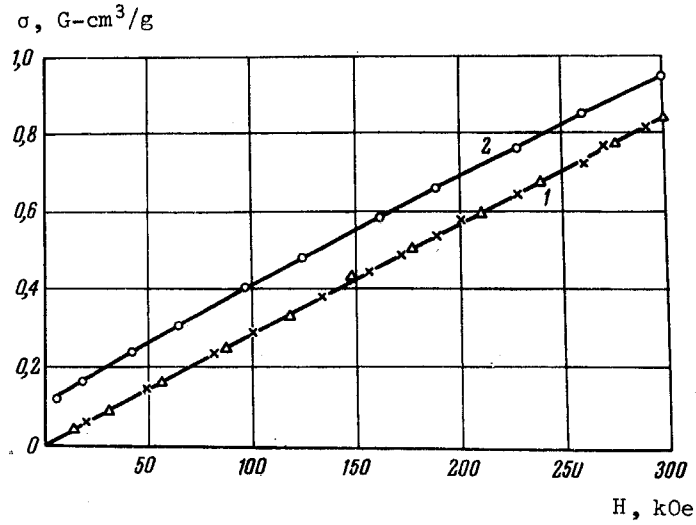

Fig. 2. Magnetization curves of polycrystalline sample of $Mn_2Ge_{0.2}Sb_{0.8}$: 1 - 140 and 200°K, 2 - 77°K.

with the results of the investigated system $Mn_{2-x}Cr_xSb$, we observed at nitrogen temperatures a new magnetic transformation in the $Mn_2Ge_ySb_{1-y}$ system, which apparently can be interpreted as a transition from the antiferrimagnetic state into the state of weak ferromagnetism. It should be noted that this transformation was observed at all germanium concentrations at which the antiferromagnetic state is realized, and we present only the results obtained for the alloy with y = 0.20, for in this alloy we have the greatest temperature interval of existence of the antiferromagnetic state.

Figure 1 shows the temperature dependence of the magnetization of the sample of $Mn_2Ge_{0.2}Sb_{0.8}$ in fields of 17, 100, and 240 kOe. The horizontal sections on the $\sigma(T)$ plot correspond to the antiferromagnetic state, and the increase of the magnetization with increasing temperature corresponds to the start of the AF-FM transition, while the increase of the magnetization in the nitrogen-temperature region corresponds to the new magnetic transformation.

The shift of the temperature of this transformation by a magnetic field, as noted in Fig. 1, shows that the magnetic transformation is connected with a first-order transition, i.e., a transition from one magnetic order to another. The character of the transition can be established to a certain degree from the magnetization curves plotted at different temperatures. The results of such measurements are shown in Fig. 2. Line 1 corresponds to the temperatures 140 and 200°K. It follows from Fig. 1 that an antiferromagnetic structure should be realized in the entire range of magnetic fields. The $\sigma(H)$ plot at these temperatures is actually a straight line passing through the origin. On the other hand, at 77°K, a new structure should be realized in the entire range of magnetic fields, and the difference of the curves 2 and 1 in Fig. 2 offers evidence that this structure is actually realized.

Curve 2 on Fig. 2 in fields up to 150 kOe is well described by the relation $\sigma = \sigma_s + \chi H$, shich should be satisfied by antiferromagnets. The magnetic susceptibilities χ before and after the transformation are quite close, as expected, since the susceptibility remains practically unchanged in the antiferromagnetic state. In fields with $H > 150$ kOe, we observe in Fig. 2 a certain approach to saturation, as should also be the case for weak ferromagnetism in strong magnetic fields. Thus, the results of our measurements allow us to assume that the observed magnetic transformation corresponds to a transition from the antiferromagnetic state into a weakly magnetic one.

Since the magnetic properties of all the subsystems of the $Mn_{2-x}A_xB_ySb_{1-y}$ system are apparently qualitatively the same, one can expect an analogous transformation also for other alloying elements. Experiments performed by us with the alloy $Mn_{1.92}Cr_{0.08}Sb$ confirmed the correctness of this assumption.

Final conclusions concerning the character of the observed magnetic transformation can be drawn only on the basis of an analysis of the results obtained with single-crystal or at least textured samples. Measurements on textured samples are now under way.

[1] T. A. Bither, P. K. Walter, W. H. Cloud, T. J. Swoboda, and P. E. Biersted, J. Appl. Phys. 33S, 1346 (1962).

[2] T. J. Swoboda, W. H. Cloud, T. A. Bither, M. S. Sadler, and H. S. Jannet, Phys. Rev. Lett. 4, 509 (1960).

[3] P. E. Biersted, F. J. Darnell, W. H. Cloud, and R. B. Flippen, ibid. 8, 16 (1962).

E R R A T U M

Article by V. A. Belyakov and Yu. M. Aivazyan, Vol. 7, No. 12, p. 370

The last two lines of the article read "The first two crystal maxima are at the Bragg angles ∿16 and 23°, and the first two magnetic maxima at ∿11 and 20°." They should read: "The first two crystal maxima are at the Bragg angles ∿7.5 and 9°, and the first two magnetic maxima at ∿5 and 6°." This was pointed out to the authors by G. V. Smirnov.

N O T E

For technical reasons, the balance of the Russian version of Vol. 8 No. 11 will be published in Vol. 8 No. 12 of the translation.