estimated to be 70%, and taking into account the contribution from the angle range $\theta < 20$, the relative probability of π^--meson β decay becomes

$$(\pi^- \rightarrow e^- + \bar{\nu})/(\pi^- \rightarrow \mu^- + \bar{\nu}) = (1.2 \pm 0.7)\cdot 10^{-4}.$$

Within the limits of errors, this quantity agrees with the relative probability of β decay of positive mesons and with the aforementioned value calculated on the basis of the universal V-A theory of β interaction.

The authors express their gratitude to T. S. Sazhneva, L. I. Krasnoslobdtseva, and Yu. L. Saĭkina for help in scanning the photographs.

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Translated by J. G. Adashko
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ON THE SUPERCONDUCTIVITY OF THE COMPOUND BiPt

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Submitted to JETP editor June 13, 1959

J. Exptl. Theoret. Phys. (U.S.S.R.) **37**, 880-881 (September, 1959)

THE data of different authors on the transition temperature for the compound BiPt differ considerably one from another. According to Matthias[1] $T_c = 1.21°K$; Alekseevskiĭ found in one case $T_c = 2.4°K$ but other alloys of the composition BiPt did not become superconducting until 1.3° K.[2,3] We may, then, suppose that the different behavior of alloys with composition BiPt at helium temperatures is related to the conditions of preparation.

In their study of the phase diagram of the bismuth-platinum system, Zhuravlev and Kertes[4] found that the compound BiPt has only one crystallographic form, belonging to the hexagonal system with lattice spacings $a = 4.20\,A$ and $c = 5.55\,A$, and has the AsNi type structure.[5,6]

We repeated the thermal analysis with differential measurement on a Pk-52 instrument and an x-ray examination from 20 to 600° C and confirmed the existence of only one crystalline form. The measurements showed that the NiAs structure was retained up to high temperatures and the coefficient of thermal expansion was derived. In the direction of the hexagonal axis $\alpha_{\|} = 4.0 \times 10^{-6} \pm 1.0 \times 10^{-6}\ \mathrm{deg}^{-1}$, and perpendicular to the axis $\alpha_{\perp} = 19.0 \times 10^{-6} \pm 2.0 \times 10^{-6}\ \mathrm{deg}^{-1}$.

We examined alloys that had various heat treatments and corresponded both to the stoichiometric composition BiPt (48.3% Pt by weight) and to higher and lower bismuth content (45 and 53% Pt by weight) than corresponds to BiPt. For alloys annealed and rapidly cooled from various temperatures which did not exceed the liquidus temperature for the given composition, the main phase (the compound BiPt) always had the AsNi type structure with $a = 4.315$ and $c = 5.490 \pm 0.005\,A$.

If these same alloys were rapidly cooled from temperatures 50, 100 and 200° C above the liquidus point, then defect structures are formed.

A reduction in unit cell dimensions of the NiAs phase (BiPt) was found from x-ray powder photographs of these alloys, and the higher the temperature from which the alloys were cooled and the greater the bismuth content, the greater was the reduction in unit cell dimensions. The maximum reduction in volume of the unit cell was ~ 0.8% of the cell volume of the 48.3 wt % Pt alloy, obtained with an alloy containing 45 wt % Pt, quenched from 950° C (~ 200° above the liquidus line).

The difference in superconducting properties of various alloys prepared from bismuth and platinum and corresponding to the composition BiPt or close to it, is most likely due to the formation of a defect structure based on the BiPt structure. This is probably produced because of the high rate of cooling the liquid alloy, when on crystallizing into the NiAs structure all the vacant sites are not occupied by bismuth or platinum atoms. The defect structure is apparently formed with platinum deficiency. The decrease in unit cell dimensions leads to a reduction in the minimum bismuth-bismuth interatomic distance, which produces a change in T_c. This agrees well with the previously noted[7] increase in T_c with decreasing minimum bismuth-bismuth interatomic distance in superconducting bismuth compounds with the AsNi structure.

We are grateful to Professors G. S. Zhdanov and N. E. Alekseevskiĭ for discussion of the results.

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Translated by R. Berman
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ON THE MAGNETO-ELECTRICAL EFFECT IN ANTIFERROMAGNETS

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Submitted to JETP editor June 17, 1959

J. Exptl. Theoret. Phys. (U.S.S.R.) **37**, 881-882 (September, 1959)

LANDAU and Lifshitz[1] have shown that there may occur in some antiferromagnetic crystals a peculiar phenomenon, namely that if a crystal is placed in a constant magnetic (or electric) field, an electric (or magnetic) moment proportional to the field is produced in the crystal.

This phenomenon, which can naturally be called the magnetoelectric effect, is intimately connected with the magnetic symmetry of the substance. Indeed, the thermodynamic potential of such a solid must contain terms proportional to the product of the first powers of the electrical and magnetic field components ($\Phi \sim EH$). It is at once clear that this is impossible in a paramagnetic crystal, since its thermodynamic potential is invariant with respect to a change in the time direction ($t \rightarrow -t$, R-transformation) in which, as is well known, the magnetic field changes sign while the electrical field does not. The position is, however, essentially altered for substances which have a magnetic structure. The magnetic-symmetry group of such solids may either not contain the R-transformation at all, or may contain it only in the form of a combination with other symmetry elements, so that the appearance of terms proportional to EH in the thermodynamic potential turns out to be possible.

We should like to show here that among the well-known antiferromagnetic substances there is one, namely Cr_2O_3, where the magneto-electric effect should occur from symmetry considerations. The magnetic structure of Cr_2O_3 is well known from the neutron-diffraction studies of Brockhouse[2] and the susceptibility data (McGuire et al.[3]). It is easy to verify that the magnetic symmetry class of Cr_2O_3 consists of the following elements:

$$2C_3,\quad 3U_2,\quad IR,\quad 2S_6R,\quad 3\sigma_d R,$$

where C_3 is vertical axis of symmetry of third order, U_2 a horizontal symmetry axis of second order, I an inversion, S_6 a mirror axis of the sixth order, and σ_d a plane of symmetry.

The transformations of this class are invariants of two expressions linear in **E** and **H**: $E_z H_z$ (the z axis is along the crystal axis) and $E_x H_x + E_y H_y$. The thermodynamic potential of Cr_2O_3 has therefore as a function of **E** and **H** the form