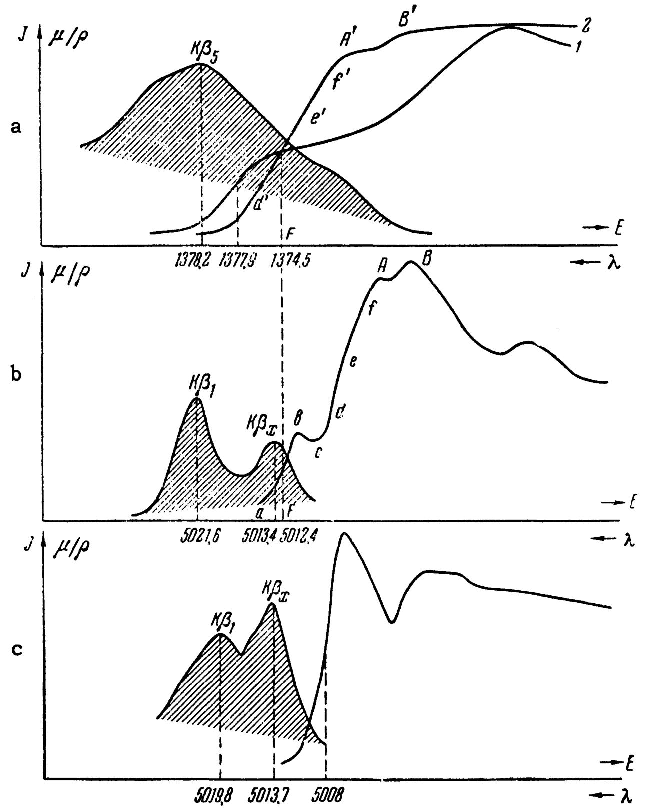

Dependence of the emission-line intensity J and of the coefficient of mass absorption μ/ρ on the wavelength: a – spectra of Cu: curve 1 – copper metal, curve 2 – copper in CuS; b – spectra of sulfur in CuS; c – spectra of pure sulfur. The emission lines are shown shaded. The energy scale is 0.86 ev per division, corresponding to 0.13 xE in the region of wavelengths of the copper edge and to 1.74 xE in the region of wavelengths of the sulfur edge.

curvature relative to the abscissa axis).

6. An investigation of the $K\beta_1$ line of copper by the ionization method has shown that the spectrum of metallic copper has a satellite $K\beta'$, which is absent from the spectrum of copper in CuS, or from the spectrum of Zn.

The following is a possible interpretation of the results obtained: the electron configuration of copper (free atoms) is $3s^2 3p^4$. The shortest emission lines of sulfur, $K\beta_1$ and $K\beta_X$, are due to transitions of electrons from the filled portion 3p of the band to the 1s level. The reduction in the intensity of the $K\beta_X$ line of the S spectrum in CuS and the appearance of an additional long-wave structure in the absorption spectrum are evidence that in the CuS compound a portion of the 3p electrons of the sulfur has gone over to a different state, making it possible to excite electrons in previously-occupied states. The absorption spectrum of copper in the compound has changed in a way as to approach the zinc spectrum. It follows from this that on the average one sulfur electron has gone from the 3p state to the 4s state of copper. Actually this electron belongs to the conduction band of the entire compound, with metallic properties, the same as the "proper" 4s electron of copper, given up by each copper atom to the conduction band. The structure of the ionic residue of copper is $3d^{10}$. The absence of a satellite $K\beta'$ in the spectrum of copper in CuS is an additional argument in favor of the above.

In light of these facts, it becomes necessary to revise the structure of covellin,[3] which is considered an ionic type compound. X-ray-spectral data indicate that CuS is a compound of the intermetallic type, in which the atoms of both components give up electrons to the conduction band. This agrees with the physical properties of CuS — metallic character of conductivity and diamagnetism.

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[2] Strukturberichte, Leipzig, **2**, 10, 229 (1937).

[3] N. V. Belov, Структуры ионных соединений и металлических фаз, (Structures of Ionic Compounds and Metal Phases), U.S.S.R. Acad. Sci. 1947.

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ANGULAR DISTRIBUTIONS OF ALPHA PARTICLES FROM THE REACTION C^{12} (p, p'3α)

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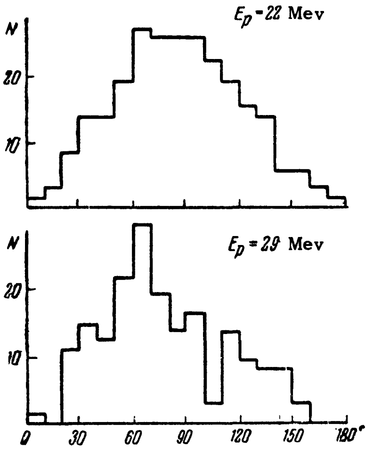
We investigated the angular distributions of α particles that result from the decay of C^{12}, induced by fast protons with energies 22 ± 1 and 29 ± 1 Mev. The decay of the C^{12} nuclei was observed in the form of five-pronged stars (three α particles and the incident and scattered protons), formed in nuclear photoemulsions Ya2 and D-NIKFI, bombarded by protons in the proton synchrotron of the Research Institute for Nuclear Physics of the Moscow State

University. The bombardment was carried out simultaneously with several proton beams of different energies, separated by a system of diaphragms from the beam of the protons scattered by a wedge-like target inside the proton-synchrotron chamber.

At the present time, after an analysis of more than 500 stars, we counted 113 stars produced by protons of the foregoing energies. The diagram shows the angular distributions of the α particles in these stars (c.m.s.). It is seen from the diagram that whereas the angular distribution is symmetrical about 90° for the 22-Mev incident protons, the symmetry is violated for the 29-Mev protons, with emission of α particles in the forward hemisphere predominating.



The angular distribution shown indicates that for 29 ± 1 Mev incident protons interact directly with the α particle of the C^{12} nucleus.

It should be noted that for 22-Mev incident protons we observed individual cases of C^{12} decay, which can be classified as direct knock-out of an α particle by a proton inelastically scattered by this particle. These cases are characterized by relatively large energies of the knocked-out α particles, compared with the energies of the two other particles and with the scattering direction of the products (taking excitation energies of the possible intermediate nuclei into account).

Direct interaction of the p—α type with decay of the C^{12} nucleus into three α particles were observed for 180 and 340 Mev incident protons.[1] Our results deduce the presence of a noticeable admixture of type p—α direct interactions for 29 Mev protons and the presence of individual cases of such interactions for 22-Mev protons.

[1] A. Samman and P. Cuer, J. phys. radium **19**, 13 (1958).

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SUPERCONDUCTIVITY OF BERYLLIUM AND ITS LOW-TEMPERATURE POLYMORPHISM

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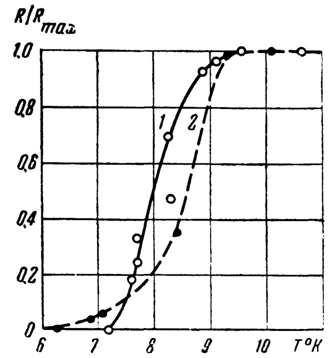
It has been reported previously[1] that beryllium, in the form of a film condensed on a substrate at liquid helium temperature, becomes superconducting at ~ 8° K. In this note we present the results of a more accurate determination of the transition temperature. The existence of low-temperature modifications of a number of metals, including bismuth and beryllium, has recently been discovered[2] and in this connection it was especially interesting to examine the superconductivity and electrical conductivity of these beryllium films.

The films were formed by the well-known method.[1,3-5] Measurements were made on the superconducting transition and the temperature dependence of electrical resistance over a wide temperature range. The results on the superconducting transition are shown in Fig. 1. The various curves refer to different films. Some difference in the transition curves is probably related to the conditions of formation of the films and their thickness. All films examined which had a thickness between 400 and 2,500 A behaved in a similar way and became superconducting in the region between 7 and 9° K, over which the resistivity increased from zero to its maximum value.

FIG. 1. Plots of the superconducting transition for beryllium films: 1 – film thickness 400 A, R_{max} = 360Ω; 2 – thickness 2300 A, R_{max} = 480Ω.



The detailed temperature variation of resistivity was studied in order to decide about a transition to a low-temperature form. Figure 2 shows this temperature variation up to about 400° K.

All films show, in common, a temperature re-