The calculated values of H_{cj} near T_c are, in both cases, close to the theoretical values calculated from the relation

$$H_{cj}/H_{cm} = (\sqrt{2}/3 \sqrt{3}) d/\delta, \qquad (1)$$

where d is the film thickness; δ_0 is taken as 6.5×10^{-6} cm, as follows from Zavaritskiĭ's work.[6]

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Translated by R. Berman
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THE SUPERCONDUCTIVITY OF ELECTROLYTICALLY DEPOSITED COPPER-BISMUTH ALLOYS

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WHILE studying the phase structure of electrolytically deposited copper-bismuth alloys, it was found that, depending upon the value of the overvoltage at the cathode, alloys could be obtained containing both mixtures of copper and bismuth crystals (in agreement with the equilibrium diagram of this system) and non-equilibrium phases.[1] Alloys consisting of non-equilibrium phases occurred at high overvoltages at the cathode in the form of dense silver-colored deposits in the composition range 40 to 90 wt % bismuth.

Data obtained by thermal analysis and x-ray studies allowed the supposition that these alloys contained a non-equilibrium phase, the decomposition of which occurred at a temperature of about 120° C. In alloys containing between 40 and 60 wt % bismuth, on the basis of thermal analysis data, we succeeded in discovering, as well as the non-equilibrium phase mentioned, yet another unstable phase, the decomposition of which started at a temperature of about 60° C. The absence in x-ray photographs of reflections from this phase prevented the establishment of its nature.

The existence of superconductivity has been shown in unstable compounds of bismuth with rhodium and various other metals;[2,3] it was, therefore, of interest to explore the possibility that superconductivity might appear also in the copper-bismuth alloys described above. Electrolytic deposits of copper-bismuth alloys were obtained from a solution of the following composition: $1N$ $Cu(ClO_4)_2$, $4N$ $Bi(ClO_4)_3$, $4N$ $HClO_4$. The deposits were obtained with current densities of from 80 to 250 ma/cm^2. The amount of bismuth in the alloys varied from 25 to 90 wt %. For the measurements specimens in the form of copper plates $30 \times 3 \times 0.05$ mm were used, on both sides of which the copper-bismuth alloy was deposited electrolytically. Measurements on such specimens in liquid helium showed that on lowering the temperature their electrical resistivity fell sharply (see Figure; Cu-Bi alloy with 20% Cu). The resistance drop usually occurred close to 2° K, and changed slightly on changing the amount of copper in the alloy.
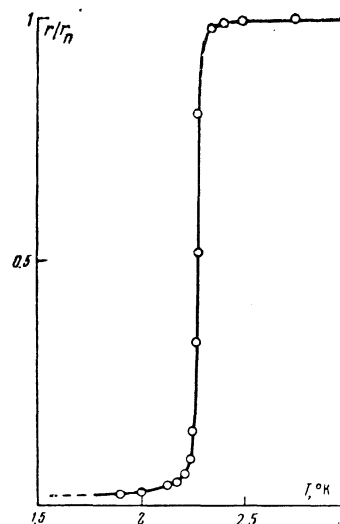
If the specimens were annealed at 120° C, the resistance drop was not observed on re-measuring down to 1.5° K. It should be noted, however, that if the anneal was at 80° C, the resistance drop did not disappear. The sharp decrease of specimen resistance was naturally considered as due to the transi-

tion of the Cu-Bi alloy into the superconducting state. This supposition was supported by the fact that switching on a magnetic field, at a temperature lower than the temperature of the drop, caused an increase of resistance, i.e., destroyed the superconductivity. Measurements on one specimen gave $dH_c/dT \approx 1000$ oe/deg.

On the basis of the results obtained, it can be concluded that a non-equilibrium phase formed at high overvoltages at the cathode undergoes a transition into a superconducting state at a temperature of about 2.2°K. An anneal at 120°C causes the decomposition of this phase, as a result of which superconductivity disappears. When the anneal is performed at a lower temperature (80°C), causing the decomposition of the second non-equilibrium phase, superconductivity is preserved. Thus, the second non-equilibrium phase is not responsible for the appearance of superconductivity in copper-bismuth deposits.

X-ray investigations of the copper-bismuth alloys obtained showed that unannealed specimens gave only weak diffuse rings, which can be taken as due to either high internal stresses or to the absence of long-range order in the system. An anneal at 120°C causes the decomposition of the non-equilibrium phase and the appearance on the x-ray photograph of reflections corresponding to the lattices of pure copper and bismuth. Further investigations will probably allow a more detailed explanation of the nature of the new non-equilibrium phase in the copper-bismuth system; however, it can be seen even now that the electrolytic method of obtaining metals under conditions of high overvoltage at the cathode allows phases to be obtained which are very far from equilibrium and which possess a number of new properties, amongst which, as follows from the account given, the appearance of superconductivity is possible.

We express gratitude to S. Ya. Berkovich for help in the measurements.

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FORMATION OF THE ISOMER Cd¹¹⁵ᵐ BY THE FISSION OF GOLD UNDER THE ACTION OF HEAVY IONS

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COMPOUND nuclei with large angular momentum are formed by the irradiation of the nuclei of the heavy ions C, N, and O. In the event of nuclear fission, their rotation causes an anisotropic angular distribution of the fission fragments,[1] and the degree of anisotropy increases with increasing angular momentum of the compound nucleus. Besides this, apparently, the increase of the angular momentum of the nucleus must influence the isomer yield of the fission fragments. It is of interest to determine, if only qualitatively, the dependence of the yields of some isomers among the fission fragments on the magnitude of the total angular momentum of the fissioning nucleus.

The dependence of the production cross sections of Cd^{115m} ($T_{1/2} = 43d$, $I = \frac{1}{2}$) and of the isomer Cd^{115m} ($T_{1/2} = 43d$, $I = \frac{11}{2}$) on the energy of incident particles was investigated by some workers in the fission of different nuclei by neutrons, protons, deuterons, and alpha particles.[2] A general tendency for increased isomer yield was observed with increased energy of the incident particle. But a more rigorous comparison of these data is difficult because of the necessity of accounting for the nuclear cascade in reactions with light fast particles.

The purpose of the present work has been the determination of the emission ratio of Cd^{115} and Cd^{115m} in the irradiation of gold by C^{12}, N^{14}, and O^{16} ions. The experiments were carried out with the 150 cm cyclotron at the Institute of Atomic Energy of the U.S.S.R. Academy of Sciences. The target was a gold foil 13μ thick. The target was irradiated within the cyclotron chamber at radii of 67 and 61 cm, which correspond to 102 and 85 Mev for oxygen or 78 and 64 Mev for carbon. The target was irradiated with nitrogen ions at a radius of 67 cm (89 Mev). The ion current was 0.2 − 0.5 μa. The duration of irradiation was 2 − 3 hours. After irradiation, the foil was dissolved in aqua regia. To this were added carriers of cadmium, actinium, rubidium, silver, and iron in amounts of 15 mg. The CdS was separated from the solution. The chemical yield was determined by the weight