effective potential barrier for the tunneling, by an amount $P_{\perp}^2/2m^*$ (m^* = reduced mass of electron and hole). It can therefore be assumed that deep in the forbidden band the electron and hole momenta are directed predominantly along the field, and consequently the dipole moments of the transition are oriented along the field for the light holes and perpendicular for the heavy ones, so that in the region of the absorption edge that is shifted by the field, the major contribution to $\alpha_{\parallel}$ is made by the light holes, and that to $\alpha_{\perp}$ is made by the heavy holes. But the light holes, owing to their small mass, tunnel much more effectively than the heavy ones, and there are therefore grounds for assuming that $\Delta\alpha_{\parallel} > \Delta\alpha_{\perp}$ in the frequency region corresponding to the forbidden band in the absence of the field. Calculations made within the framework of the simplest model of the complex band structure described above, i.e., the Kane model [4], without allowance for the spin-orbit splitting and for the influence of the higher bands, confirm these qualitative considerations. Thus, the experimental data [5] confirm the qualitative considerations of theoccurrence of anisotropy of the electroabsorption in the case of degenerate bands. However, no quantitative comparisons of the epxerimental results and the calculations were made, since the employed theoretical model was too idealized, and particularly since it did not take into account the fact that in the absence of an electric field the absorption edge is smeared out.

We did not investigate the connection between the anisotropy effect and the crystal orientation, although a connection between the two is possible.

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EXPERIMENTAL OBSERVATION OF THE CHANGE OF THE SIGN OF THE S-d EXCHANGE INTERACTION

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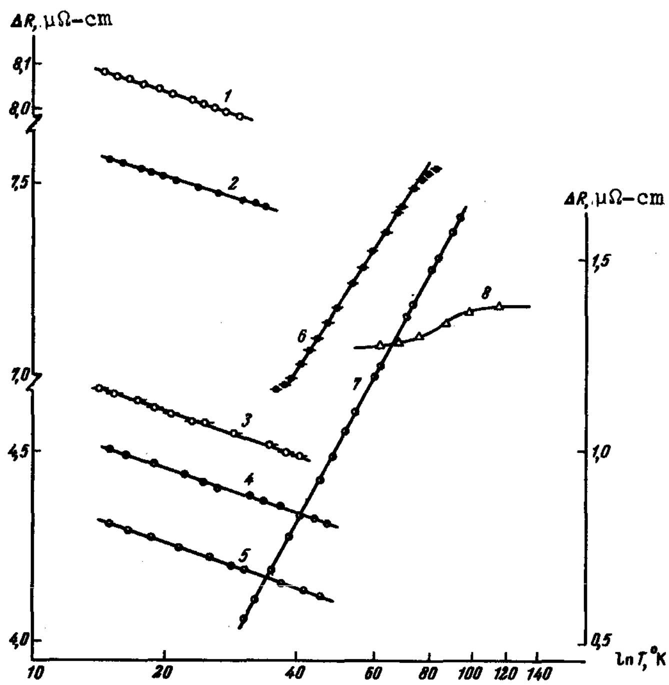
Submitted 23 December 1968
ZhETF Pis. Red. 9, No. 3, 189 - 191 (5 February 1969)

According to [1 - 4], the scattering of conduction electrons by localized magnetic moments of paramagnetic impurity atoms leads to an additional resistance, and the sign of the temperature-dependent part of this resistance is uniquely determined by the sign of the S-d exchange interaction.

It is shown in [5] that for a one-percent solution of iron in copper at T = 40°K, the R-T curves have a minimum, which results from the addition of two scattering mechanisms: the electron-phonon mechanism and the mechanism of conduction-electron scattering by the localized magnetic moments. As is well known, a positive spin polarization of the matrix is observed for solutions of iron in palladium [6]. Considerable interest attaches to the behavior of the magnetic component of the resistance on going from negative S-d exchange interaction to a positive interaction that leads to the polarization of the matrix.

We investigated the temperature dependence of the electric resistance of 1% solutions of iron in Cu_{1-x}-Pd_x alloys (x = 0.01, 0.02, 0.05, 0.1, 0.2, 0.3, 0.6, 0.8). According to



1 – $(Cu_{0.80}Pd_{0.20})_{0.99}Fe_{0.01}$,
2 – $(Cu_{0.90}Pd_{0.10})_{0.99}Fe_{0.01}$,
3 – $(Cu_{0.95}Pd_{0.05})_{0.99}Fe_{0.01}$,
4 – $(Cu_{0.99}Pd_{0.01})_{0.99}Fe_{0.01}$,
5 – $(Cu_{0.98}Pd_{0.02})_{0.99}Fe_{0.01}$,
6 – $(Cu_{0.7}Pd_{0.3})_{0.99}Fe_{0.01}$,
7 – $(Cu_{0.4}Pd_{0.6})_{0.99}Fe_{0.01}$
8 – $(Cu_{0.2}Pd_{0.8})_{0.99}Fe_{0.01}$

x-ray data, all the samples were single-phase. It turned out that the R-T curves of the iron solutions in alloys with x = 0.01, 0.02, 0.05, 0.1, and 0.2 exhibit a pronounced minimum at T = 40°K. According to our investigations of the magnetic susceptibility, the localized magnetic moment of these alloys remains constant. It can be assumed that in this case the electron-phonon component of the resistance remains unchanged.

At 30 and 60 at.% palladium concentrations in copper, the character of the R-T curves changes qualitatively. The figure shows the temperature dependence of the resistance difference $\Delta R = R_{alloy} - R_{matr}$, where R_{alloy} is the resistance of the 1% iron solutions in the palladium-copper alloys and R_{matr} is the resistance of the palladium-copper alloys. As seen from the figure, in the investigated temperature interval the "magnetic" resistance component is satisfactorily described by the quantity $A \ln T$, where A is negative up to 10 at.% palladium concentration in the copper, and positive at higher concentrations. Assuming that in this case the scattering by the paramagnetic impurity atoms is determined by the Kondo mechanism, it can be asserted that for alloys with 30 and 60 at.% palladium in copper the sign of the exchange interaction is positive. The change of the exchange-interaction sign is apparently due to the appearance of d-carriers at concentrations larger than 30 at.% [1)].

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