electron-gas results it seems unlikely that this effect is produced by electron-electron correlations. Comparison with the positron data suggests that high-momentum components in the electronic wave functions are spatially associated with regions of large core potential. Neither a simple core orthogonalization derivation nor a pseudopotential calculation accounts adequately for the true profile shape. A more detailed calculation appears to be warranted.

The Compton data have been compared with estimates of the core contribution derived on the basis of (a) the "impulse" approximation, using Clementi's[10] 1*s* wave function, and (b) a free-atom-like numerical calculation, using the Herman-Skillman potential for both the initial and final states. It agrees best, however, with a calculation in which an altered and probably over-relaxed potential is used for the recoil state. Experimental resolution of the details of core electron scattering may require additional data, specifically aimed at measuring the asymmetry in the profile tails.

ACKNOWLEDGMENTS

We wish to acknowledge a number of useful conversations with Walter Phillips and with Richard J. Weiss. We also appreciate the support and interest of B. L. Averbach. This research was sponsored by Advanced Research Projects Agency (Contract No. SD-90), the National Science Foundation (Contract No. GP-7677), and Air Force Materials Laboratory, MAMP (Contract No. F33615-67-C-1226).

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[*] Work based in part on a thesis submitted to the Department of Metallurgy and Materials Science by R. Currat in partial fulfillment of the requirements for the Ph. D. degree.

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PHYSICAL REVIEW B VOLUME 3, NUMBER 2 15 JANUARY 1971

Hall Effect in the Pd-H System

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(Received 12 June 1970)

The Hall effect of the palladium-hydrogen system has been investigated as a function of the hydrogen content at a temperature of 25 °C. The Hall coefficient rapidly decreases at atomic ratios H/Pd > 0.83. The effective number of electrons per palladium atom for atomic ratio H/Pd > 0.83 was calculated. A high-pressure method of saturation was used.

Recently, with the new capability of obtaining gaseous hydrogen under very high hydrostatic pressures up to 25 kbar[1] and 28 kbar,[2] the relationship between the relative electric resistance R/R_0 and the atomic ratio H/Pd in the Pd-H system for H/Pd > 0.8 has been found.[3] In this investigation the authors took into account the known linear relation between the atomic ratio H/Pd and the logarithm of the hydrogen pressure, valid for the pure β phase, replacing pressure by the hydrogen fugacity. The results of some recent experiments[4] have proved that, in the range of the atomic ratios H/Pd up to 0.97, calculations made on this basis and applied in Ref. 3 were certainly correct. The results ob-

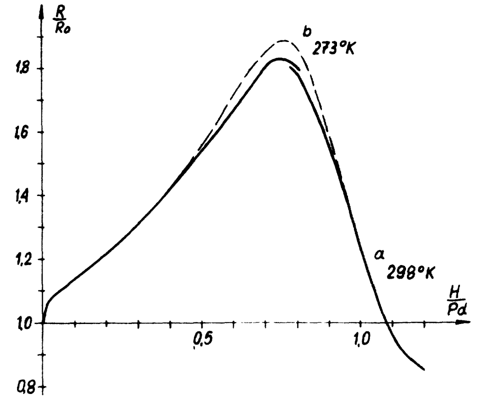

FIG. 1. (a) Relative electrical resistance of palladium, R/R_0, at 25 °C as a function of the atomic ratio H/Pd. Here R is the actual resistance of the specimen, and R_0 is the initial value for the hydrogen-free state; (b) curve interpolating data from Ref. 4.

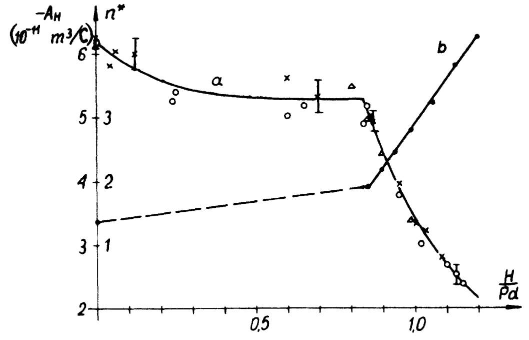

FIG. 2. (a) Hall-effect data for Pd-H system. (b) Effective number n^* of free electrons per palladium atom.

tained in Refs. 3 and 4 are shown in Fig. 1.

In our investigations, the relationship mentioned above has been used for calculations of the atomic ratio H/Pd.

In previous investigations of the Hall effect in the Pd-H system[5,6] for atomic ratios H/Pd up to 0.8, only a slight decrease of the Hall coefficient was observed. For Pd-Ag-H it has been shown[7] that the Hall coefficient decreases slowly in the coexistence region of the α and β phases. In the region of pure β phase of that system this decrease was more pronounced. In this region the Hall coefficient A_H appears to be a linear function of the atomic ratio H/metal. For the Pd-Ag alloy containing 30 at.% of Ag, the largest decrease in the magnitude of Hall coefficient was observed (about 25% of the original value).

The purpose of our investigation was to measure the Hall coefficient at the highest obtainable atomic ratio H/Pd. The high-pressure apparatus described in Ref. 1, with the electromagnet placed inside of the pressure chamber, was used. Measurements were performed on 38-μ-thick foils using the conventional dc method ($I_{max} = 1$ Å, $B_{max} = 15$ kG). Values of magnetic induction in each measurement were checked by means of a ballistic galvanometer. The conventional four-probe potentiometric technique was used to measure the resistance of the foil. The temperature was kept at about 25 °C. The details of the device will be described elsewhere.

The results of our measurements of the Hall coefficient are shown in Fig. 2(a).

The observed changes of the Hall coefficient below the atomic ratio H/Pd = 0.83 were rather small. The coefficient A_H decreased with the increase of the atomic ratio H/Pd, similarly as in Refs. 5 and 6. For H/Pd > 0.83 the decrease of the Hall coefficient was much greater. The plot of this coefficient against the atomic ratio H/Pd seems to be a branch of a hyperbola. In this region the Hall coefficient A_H can be expressed by a formula valid for the one-band model: $A_H = V/n^*\nu e$, where e is the electronic charge, V is the volume of the unit cell, ν is the number of atoms per unit cell, and n^* is the effective number of electrons per atom.

Using the above-mentioned expression for A_H, the value of n^* was calculated. The results are shown in Fig. 2(b). Additional measurements have shown that the Ettingshausen-Nernst and Righi-Leduce effects, which could disturb the Hall voltage measurements, were negligible in comparison with the Hall effect itself. No Ettingshausen effect was observed.

Note added in proof. The measurements of Hall coefficient of pure Pd under high hydrostatic pressure (up to 20 kbar using benzene as a pressure medium) have not shown changes of this coefficient exceeding ± 2%.

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