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The Hall Effect and Specific Resistance in Evaporated Films of Nickel, Cobalt, Palladium and Platinum

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0.09 to 0.23. The average error is estimated to be about 5 per cent. The accuracy is greatest for the middle range of wavelengths, 3500-4000 A.

THE HALL EFFECT AND SPECIFIC RESISTANCE IN EVAPORATED FILMS OF NICKEL, COBALT, PALLADIUM AND PLATINUM

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Steinberg [1] has shown that in the case of a thin film of metal formed by evaporation from a heated filament in a high vacuum. the specific resistance and Hall coefficient are not the same as for the bulk metal. The metals investigated were silver, copper and iron, and in all of these the specific resistance was found to be about 1000% greater than in the metals in bulk. The Hall coefficients were slightly smaller for silver and copper than for the bulk metals, but for iron this coefficient was about 600% greater than the value generally accepted for iron. Also, the magnetic field necessary to produce saturation in the Hall electromotive force was considerably smaller for evaporated iron than for bulk iron. These differences he explained on the belief that evaporated films consist of granules not in such intimate contact as in the bulk metals which has the effect of increasing the resistance and changing the magnetic properties of the metal. On account of the bearing which this work might have on theories of magnetism and electric conduction, it seemed desirable to extend this investigation to other metals.

Metals of the platinum group in the periodic table were chosen for further work for the reason that this group includes both ferromagnetic and paramagnetic metals as well as metals having positive and negative Hall coefficients. Work has now been done on platinum, palladium, nickel and cobalt, the first two being paramagnetic and the last two ferromagnetic. In each of these metals the specific resistance for the evaporated metals is greater than for the bulk metals, being about 400% greater for palladium and 1000% for the others. Palladium and platinum both have negative Hall coefficients of slightly lower value than in the bulk metals. The results on cobalt are very much the same as Steinberg obtained for iron, the Hall coefficient being positive and about 500% greater than for iron in bulk form. Although nickel has a negative Hall coefficient, it is otherwise very similar to the other

[1] State University of Iowa, Physics Laboratory.

ferromagnetic metals, iron and cobalt. As in the case of iron, the magnetic field necessary to produce saturation is lower for evaporated films of cobalt and nickel than for the bulk metals.

UNIVERSITY OF IOWA.

IS IOWA GETTING WETTER OR DRIER?

CHARLES D. REED

A brief analysis of long period rainfall records in various portions of the state.

THE INTRINSIC INTENSITY AND PERCENT OF POLARIZATION OF LIGHT TRANSMITTED THROUGH DEEP SLITS

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(*ABSTRACT*)

It is assumed that the light incident upon the first opening of a slit between various metals is diffracted in the usual manner, and finally emerges from the far end of the slit after repeated reflections. The reflecting coefficients of the various metals considered are calculated for the proper angles of incidence from a knowledge of the index of refraction of the metal, and from its coefficient of absorption. In view of the fact that the coefficients of reflections for light possessing an electric vector perpendicular are much larger than for light with the electric vector parallel to the plane of incidence, there will be partial polarization of the emergent light.

The two factors; transmission, and polarization, have been calculated for the metals Cu, Au, Ag, Ni, Fe, and Si, for a given slit; and for a slit with steel jaws, a large number of calculations have been made for various cases in which the width and depth of the slit, and the wave-length of the incident light have been varied. A brief review of these calculations shows the following significant facts.

1. The per cent of polarization of the emergent light is largest for those metals that possess the greatest differences in the reflection coefficients for the electric vector perpendicular, and parallel, respectively, to the plane of incidence. Among the metals tested, silicon shows, with a given slit the greatest polarization.

2. With a given width and depth of a slit between steel jaws