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The Intrinsic Intensity and Percent of Polarization of Light Transmitted through Deep Slits

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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.

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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

L. P. SIEG

(*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

the transmission decreases with increase in wave-length; the polarization increases.

3. With a given width of slit, and a given wave-length, the transmission decreases with increased depth of slit, the polarization increasing.

4. With a given depth of slit, and a given wave-length, the transmission increases with increase in width of the slit, the polarization decreasing. Some of these conclusions have been verified by direct experiment. It is hoped to test the remainder in the near future.

The results of the calculations indicate that if one is to measure the intensity of transmitted light by means of varying the width of a given slit, or if one is measuring the polarization of a given source of light, and in the process of this measurement the light is made to pass through a narrow, or a deep slit, then serious errors are almost certain to arise.

The full details of the theory will probably be published in the Journal of the Optical Society.

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MAGNETIC PROPERTIES OF EVAPORATED IRON FILMS

A. SORENSON

A study was made of the magnetic properties of iron films deposited on tin foil in a high vacuum by the evaporation method used by J. C. Steinberg. The magnetization curves and hysteresis loops were obtained by an induction method in which the specimen, inserted in a search coil, was placed in a magnetic field of known strength and then suddenly removed from the search coil. The resulting flux was measured by means of a galvanometer which, in order to obtain the required sensitiveness, was kept on open circuit all the time except for an instant while the current passed through it. The results show that iron in this form possesses a high degree of hardness, displayed in a high coercive force. This hardness is now manifest in the thin films, but the maximum intensity of magnetization attainable seems to be independent of thickness. The work will be extended to include nickel and cobalt.

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