

TIME FACTOR IN ELECTRIC BIREFRINGENCE OF GLASS

THAT electric birefringence has a time-lag behind the instant of the application of the electric field has been well known ever since the discovery of the effect by Kerr in 1875. This time-lag has also been known to be of much greater magnitude in solids than in liquids and gases. Kerr himself estimated the lag for glass as about half a minute, within which, he observed, the substance exhibits full and maximum birefringence. While this has been found to be substantially true—at least approximately—in the densest flint glass containing the highest percentage of lead, recent experiments undertaken to determine the Kerr coefficient in a variety of glass samples have, however, revealed interesting departure from Kerr's conclusions on the point. It has been observed in all varieties of glass, except the densest flint referred to above, that although the electric birefringence and, therefore, the Kerr coefficient increases at first to a positive maximum within about a minute of the application of the field, in the intervals of the time to follow, they do not remain constant at that peak value in a steadily applied field of force. For several minutes to follow, these varieties have all exhibited a decreasing birefringence settling down to a minimum of residual positive value in cases of lead glasses, and to a minimum of reversed negative value in samples free from lead; the time required for this downward creep depending on the composition of sample under observation. The amplitude of the downward creep and of the reversal, as the case may be, has been found to be magnified by an increase in the applied field, while the time-lag of the effects in general is observed to decrease.

The effect observed on the withdrawal of the field, having almost the nature of an optical image of that observed on the application, is also highly interesting. Contrary to Kerr's observation that the electric birefringence decreases steadily to zero value within about half a minute of the withdrawal of the field (which has, of course, been confirmed with the densest flint glass containing the highest percentage of lead), it has been observed in all other varieties that the birefringence diminishes down to a reversed negative value within about a minute of the withdrawal of the field, and then tends slowly to creep up to zero value in several minutes to follow, the time required by the sample to revert to its normal condition of non-birefringence, being usually long, and also depending on the composition of the variety under examination.

The nature of the variation observed seems to suggest that the total effect observed is due to the superimposition of two component effects of opposite signs, one of which, the positive one, is to be taken as the Kerr effect as regards the negative components, it might, at the first thought, be taken as the electrostriction effect. But the effect arising out of the electrostriction may be estimated in any sample either by the experiment or from theoretical considerations. This must be very small in

comparison with electro-optical effect, for, in glass, while the coefficient of the electro-optical effect is of the order of 10^{-9} , that for the strain-optical effect has the order of 10^{-13} .

The negative effect in some cases, has, however, been observed to be of magnitude comparable with the positive. Further, strain-optical effect arising out of electrostriction should increase with the dielectric constant of the sample. But observations show that samples having a comparatively higher dielectric constant are characterised by a feeble negative effect. These considerations exclude the possibility of the negative effect being identified with electrostriction.

The details of the experiment undertaken along with the curves showing the variation of the Kerr constant with time will be shortly published in a paper elsewhere.

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College de Bussy,
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P. MITRA.

THE CHROMITE AND ASSOCIATED ROCKS OF KONDAPALLE (Kistna District)

The chromite deposits and associated rocks of Kondapalle, situated in an area ($16^{\circ} 37' : 80^{\circ} 32\frac{1}{2}'$), about ten miles to the N.W. of Bezwada, have been studied. The geological features of the area comprise, the Bezwada gneisses, the granitic gneisses and the charnockites, and the chromite deposits are restricted to the ultra-basic charnockites, mainly the pyroxenites (enstatite-hypersthene rock). The occurrence of the chromite is chiefly in the form of pockets or lenses, in disseminated patches and often in regular and perfect bands. No olivine has been found, and the serpentine noticed in certain places is due to the alteration of pyroxene. Chemical analyses of representative chromite ores from the area show that the value of Cr_2O_3 of the ore ranges from 36 to 55 per cent. The detailed field and petrographic study indicates that the chromite of Kondapalle is magmatic in origin, the ore crystallising as the first mineral and later joining with the orthopyroxene.

The charnockites, which are the main associated rocks of the chromite deposits of Kondapalle, occur as bouldery outcrops often times steep and precipitous. They reveal the development of all the four, the acid (sp. gr. 2.80), the intermediate (sp. gr. 2.91), the basic (sp. gr. 3.01) and the ultrabasic (sp. gr. 3.25) types. They are, however, best developed at Ibrahimpatnam, three miles due south of Kondapalle. The detailed field and petrographic study of these show in general, a close similarity to the charnockites from the Type area; but a slight difference in mineral composition is noticed, particularly among the norites. Garnetiferous norites, so clearly seen in the Type area, are not well developed at Kondapalle, thereby showing that the charnoc-