EFFECT OF RESIDUAL GASES ON CONTACT E.M.F.'s AND PHOTO- CURRENTS.¹

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CURVES representing both the variation of contact E.M.F.'s and saturation photo currents with time have been taken on freshly cut sodium surfaces both in the best vacuum obtainable with a Gaede molecular pump and in vessels containing residual gases.

The most striking characteristics of the photo-current-time curves is that they are of altogether different form according as the frequency of the light with which they are taken is that of the extreme ultra-violet or that of the visible spectrum. Thus, when tested with light of wave-length 5,461 Å. the photo-sensitiveness of a *freshly cut* sodium surface is zero. It rises with time to a considerable value and finally falls again to zero. When tested, however, with light of wave-length 2,535 Å., this same surface shows a large initial photo-sensitiveness which falls off steadily with time to zero.

These photo current-time curves taken in connection with the contact E.M.F.-time curves are interpreted as follows:

A freshly cut sodium surface is not sufficiently electro-positive to respond photo-electrically to light of wave-length 5,461 Å., but under the influence of an active gas, the sodium forms a new substance which is more electro-positive than the freshly cut sodium and hence is photo-sensitive to longer waves. The photo-curve taken with wave-length 5,461 Å. represents then merely the growth and decay of this substance. For sufficiently short waves, however, the freshly cut surface is itself so photo-electrically active that its own decay curve completely masks the rise and fall curve due to the growth and decay of the more electro-positive substance resulting from the action of gas upon the sodium.

In view of these results the authors raise a question as to the correctness of the conclusions of Wiedmann and Hallwachs² that photo currents are only obtainable in the presence of gas. We suggest that if the Wiedmann and Hallwachs experiments are repeated with light of sufficiently short wave-lengths instead of with visible light, it is not likely that the photo-sensitiveness will be found to vanish in the way in which it did in the experiments reported by these authors. Further experiments on potassium and lithium are in progress.

A DIRECT DETERMINATION OF "*h*."¹

BY R. A. MILLIKAN.

THE experiments herewith reported were undertaken for the sake of subjecting to rigorous experimental test the three assertions contained in Einstein's photo-electric equation³

$$\frac{1}{2}mv^2 = PDe = h\nu - P.$$

These assertions are

¹ Abstract of a paper presented at the Washington meeting of the Physical Society, April 24, 1914.

² Ber. d. D. Phys. Ges., 16, 107, January 30, 1914.

³ A. Einstein, Ann. d. Phys. (4), 20, 199, 1905.