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

BY R. A. MILLIKAN AND W. H. SOUDER.

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 Hallwachs[2] 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 equation[3]

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

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.