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Physics. — "Electrolytic phenomena of the molybdenite-detector."

By M. J. Huzinga. (Communicated by Prof. Haga)

(Communicated in the meeting of September 27, 1916)

In an inquiry into the cause of the unipolar conduction of crystal-contacts, which are used as detectors in the technics of wireless telegraphy, it was tried to demonstrate the existence of a secondary E. M. F. when the primary current had ceased.

To this purpose a current of some milliampères was for some time sent through a crystal-contact, the electrodes of which were connected to a galvanometer after stopping the current. This experiment was repeated with a reversed primary current. Whereas the deflection of the galvanometer in all other combinations inquired into was not worth mentioning, it was very large in a molybdenite-brass detector; even when the primary current had passed during part of a second only. This deflection changed, both in direction and magnitude, when the primary current was reversed. An electromèter taking the place of the galvanometer indicated 0,7 volt; as the five-cellular quadrant-electrometer, which was used, has a large capacity, the potential difference between the electrodes is undoubtedly larger; such an E. M. F. can hardly be explained by thermoelectric forces.

When, after many experiments with the same contact, a small dark-coloured spot had begun to show round about the brass point, the place of contact was observed during the passage of the primary current in a microscope magnifying thirty times.

It proved to be very fit to let a piece of the mineral float on mercury and to put upon it a platinum point with slight pression. If, now, a current of some milliampères is sent through the contact from MoS_1 to Pt, then, after some moments, in some cases after

some minutes, a small quantity of a dark blue liquid will appear on the surface of the crystal in which small gasbubbles rise. In one case e.g. the strength of the current was 6 milliampères, the impressed E. M. F. being 3 volt. If this E. M. F. between crystal and platinum fell to below 1,3 volt then the disengagement of gas could no longer be seen. If the E. M. F. of 3 volt was reversed, the current was only 0,5 milliampères, the disengagement of gas became less and could no longer be seen when the E. M. F. fell to 2 à 2,5 volt. By these experiments it is proved that in the contact molybdenite-metal, opposite to the direction of the primary current, an E. M. F. exists, due to polarisation, in consequence of electrolysis; the value of this E. M. F. of polarisation differs according to the direction of the primary current. By this the unipolar conduction has been reduced to well-known phenomena.

The inquiry into the electrolysis as appearing here, is not yet complete; though it has been found that the phenomena as described here, exactly agree with those obtained if the platinum point is brought into contact with the molybdenite not directly, but by means of a drop of acidulated water. Again the resistance is least in the direction from MoS_{2} to Pt; on the outer edge of the drop one can at first observe a green, after some time a dark-blue change of colour; without doubt an oxidation product of the mineral. In order to get the disengagement of gas the E. M. F. must be at least 1,2 volt; at the platinum point the colour of the liquid is somewhat brownish. If the current is reversed, then its strength possesses a greater value for some seconds, only to fall suddenly to a very small value. The disengagement of gas may be best seen on the side of the crystal and the liquid will also assume a brown colour on that side. In this case the disengagement of gas will only take place with an E. M. F. of 2 volt.

The intention is to extend the investigation to other combinations.

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