On the Decomposition of Silver Salts by Pressure

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ductivity of sea-water, there was no reason why the conductivity should interfere with signalling. A considerably greater conductivity must be proved for sea-water before it could be accepted that the failure of experiments on telegraphic communication with light-ships from the sea-bottom was due to that factor. It was unlikely theoretically, and Mr. Stevenson had contradicted it from a practical standpoint. For some reason, the account of the light-ship experiments had not been published, so that there was no means of finding the real cause of failure.

XVIII. *On the Decomposition of Silver Salts by Pressure.*
*By J. E. MYERS, M.Sc., Ph.D., late 1851 Exhibition Science Scholar, and F. BRAUN, Ph.D., Professor of Physics in the University of Strassburg i.E.**

As was demonstrated by Carey Lea† some years ago, silver salts and others may be decomposed by the application of pressure. By pounding a portion of the salt in a mortar one may readily effect decomposition.

A convincing proof is obtained by compressing a halogen salt of silver in the absence of sunlight and then subjecting the compressed mass to the developing and fixing processes of photography. A black residue of finely divided silver is the result. Exposure of the salt to sunlight, before compression, makes of course this test useless: the difficulty may be overcome by employing a mixture of AgNO_3 and KR ($\text{R}=\text{Cl}, \text{Br}, \text{or I}$) in the first instance.

The decomposition is most marked in the case of bromide of silver.

Two different metals immersed in liquid bromine constitute a galvanic element‡. The couple $\text{Ag}, \text{Br}, \text{Pt}$ has an E.M.F. of about 0.95 volt. It appeared therefore of interest to

* Read June 11, 1897.

† Phil. Mag. xxxi. p. 323 (1891); xxxiv. p. 46 (1892); xxxvi. p. 351. (1893); xxxvii. pp. 31 and 470 (1894).

‡ F. Braun, Wied. Ann. xvii. p. 610 (1862).

determine the E.M.F. developed when AgBr is compressed between electrodes of platinum and silver.

The salt was contained in a so-called diamond mortar, which was placed under a press and subjected to a pressure of 3000–5000 atmospheres. The apparatus did not admit of a direct measurement of pressure, but for purposes of comparison, by using the same quantity of salt and turning the lever to the same position the same pressure (approximately) could be applied. The pestle was insulated from the mortar by means of a thin sheet of mica bent into a cylindrical form. A piece of platinum foil beneath the salt, and a short cylinder of silver immediately beneath the pestle, formed the electrodes, which were connected to the quadrants of an electrometer.

The following serves to give a general idea of the run of an experiment :—

(One Daniell element gave a deflexion of 132·1 scale-divisions.)

Ag Br.	Scale-divisions.
On applying pressure, immediate deflexion . . .	1·2
after 2 minutes . . .	2·8
„ 10 „ . . .	6·8
„ 15 „ . . .	7·2
„ 40 „ . . .	9·2
„ 55 „ . . .	9·0
„ 85 „ . . .	8·7
„ 95 „ . . .	8·2
„ 105 „ . . .	7·0
Pressure removed	5·0

after which the deflexion rapidly sank to zero.

Thus the maximum E.M.F. generated was about 0·07 Daniell. The direction of current was from Ag to Pt through the compressed substance.

A higher applied pressure produced an E.M.F. of 0·09 Daniell.

The silver bromide was prepared from pure AgNO₃ by precipitation with pure KBr. Before each experiment the salt was carefully dried by heating for two hours or more at a temperature of 150° C., and then allowed to cool in a

desiccator. Pure AgNO_3 showed no appreciable E.M.F. on compression, neither did KBr: a mixture of the two in equivalent quantities compressed between electrodes of Pt and Ag had an E.M.F. of 0.08 Daniell.

With AgCl and AgI the E.M.F.'s were smaller.

Ag, AgCl, Pt = 0.03 Daniell.

Ag, AgI, Pt = 0.04 „

In both cases a marked darkening in colour was noticeable.

Somewhat remarkable is the fact that under high pressure AgBr becomes gradually transparent even when 3-4 millim. thick. At the same time the electrical resistance increases considerably. For instance, in one case the resistance increased gradually from $3.65 \cdot 10^3$ ohms to $14.62 \cdot 10^3$ ohms (measured with alternating current and telephone) in the course of 48 hours, pressure being continuously applied.

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XIX. *A Method of determining Magnetic Hysteresis loss in Straight Iron Strips.* By J. A. FLEMING, M.A., D.Sc., F.R.S., *Professor of Electrical Engineering in University College, London* *.

[Plate VII.]

THE exact determination of the magnetic hysteresis loss in sheet iron as used for alternating current transformer construction has become of commercial importance of late years. Owing to the obvious necessity for reducing the core loss in transformers to the lowest attainable limit, it is now the custom to carefully test the iron to be used and to express the determined hysteresis loss in the iron sheet, in watts per pound per 100 frequency, at a maximum induction during the cycle of 2500 C.G.S. units. Two processes are in ordinary use for effecting this measurement. The most

* Read June 11, 1897.