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XXVII. *The Changes of Property of Amalgams by Repeated Fusion.* By Dr. G. GORE, F.R.S.*

IT is well known that various alloys undergo a change of properties by repeated melting and cooling. Having found during some experiments made for examining the changes of volta-electromotive force of alloys during fusion, that an amalgam composed of 1 part by weight of cadmium and 4 of mercury gave different results after each successive melting, notwithstanding that the chemical composition of the substance remained unaltered, I took a freshly made bar of the substance and a strip of sheet platinum and formed a voltaic couple with them in a solution composed of 1 part by weight of common salt and 100 of distilled water, and ascertained the fixed amounts of deflexion it produced of the needles of an ordinary torsion-galvanometer of 50 ohms resistance after different numbers of fusions of the amalgam ; they were as follows :—

Number of Fusions.	Deflexions.
1	29
4	24
8	11
12	12

The differences of strength of current were manifestly due to the fusions, and not to any loss of mercury or oxidation of the cadmium. The amalgam melted at 98° C., and was not on any occasion heated above 130° C. There was no visible fume or sublimate caused by volatilization of the mercury, and it was found in a separate experiment that a diminution of as much as 20 per cent. in the proportion of mercury, produced only about one degree difference of deflexion of the needles.

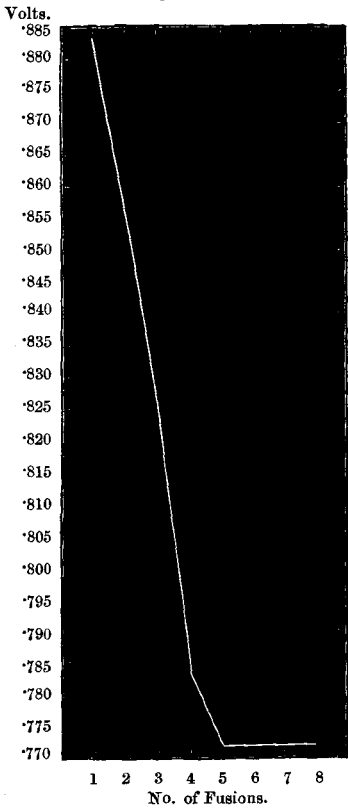
I took a second freshly made bar of the same substance, and measured the electromotive force of the couple in the same electrolyte at 17°·5 C. after each fusion and cooling, by the method of balance, with a suitable thermoelectric pile (see Proc. Birm. Phil. Soc. vol. iv. p. 130 ; ‘The Electrician,’ vol. xii. March 15, 1884, p. 414), and obtained the following results :—

Number of Fusions.	Volts.	Number of Fusions.	Volts.
1	·8809	5	·7724
2	·8553	6	”
3	·8267	7	”
4	·7838	8	”

* Communicated by the Author.

The annexed diagram shows the curve of the change.

Curve showing Effect of repeated Fusions on Cd Amalgam.



In order to ascertain whether the alloy changed in property spontaneously, a third freshly prepared bar was kept in a horizontal position and examined daily with the help of the same electrolyte and galvanometer. The following permanent deflexions were obtained :—

Number of Days.	Deflexions.	Number of Days.	Deflexions.
1 . . .	18	6 . . .	7·5
2 . . .	10	7 . . .	6·5
3 . . .	10	8 . . .	7·5
4 . . .	7·25	9 . . .	7·0
5 . . .	8·0	10 . . .	6·0

At the first moment of immersion of the couple each day the amount of temporary deflexion was about 30 degrees, and

the above numbers are the amounts of permanent deflexion produced at the end of three minutes. The bar was wiped dry after each experiment, and no error was produced by oxidation; and as a large bulk of the liquid was employed, the diminution of amount of fixed deflexion was not due to exhaustion of the solution. The diminished electromotive force indicated a spontaneous molecular change going on in the amalgam during the first few days.

In order to find whether the amalgam altered in volume by repeated fusion, the specific gravity of a freshly made piece was taken after the 1st and 6th fusion. The substance was melted under water, and no loss of weight, or oxidation occurred during the process.

After the 1st fusion the spec. grav. was = 12.5438 at 14°.5 C.

“ 6th “ “ “ “ = 12.6190 “

From the various results obtained in this research and from other considerations, I conclude that this amalgam, by the act of fusion and subsequent cooling, and by spontaneous change, suffers a loss of molecular motion, potential heat, chemical activity, voltaic energy, diminishes in volume, and becomes less corrodible in a solution of chloride of sodium. The changes appear to be permanent.

It is evident that the method employed, viz. measurement of volta-electromotive force, may be used for detecting and measuring physical changes produced in alloys by repeated melting, lapse of time, &c.

XXVIII. *On the Electrostatic Force between Conductors conveying Steady or Transient Currents.* By Dr. OLIVER LODGE*.

AT the last meeting of the Physical Society this session Mr. Boys described some attempts he had made to detect mechanical force between a pair of Hertz resonators delicately suspended and immersed in a region of electromagnetic waves.

The attempt so far had not been successful; but Mr. Boys, by attending to the energy manifested by Mr. Gregory's method and by another method of his own, showed good reason why the force, if any, was just too small to be observed even with his extremely delicate appliances, and conjectured that a moderate increase in sensitiveness would be necessary in order to detect the effect. Everyone must have full confidence that if any such mechanical effect exists Mr. Boys will show it us

* Communicated by the Author.