

Fifthly, that the greatest amount of fibrin appears when the albumen is neutral or slightly acid.

Sixthly, that the viscosity of the material employed promotes the formation of fibrin.

Seventhly, that albumen, artificially digested in gastric juice, produces fibrin by its subsequent oxidation, even after dialysis.

Eighthly, that gluten dissolved in gastric juice, and then oxidized at the ordinary temperature, yields fibrin.

The formation of fibrin in the human body, and its relation to albumen, has long been a vexed question. I venture to put forward these experiments in connexion with this important and interesting inquiry.

V. "Note on the Spectrum of Thallium." By Professor WILLIAM ALLEN MILLER, M.D., LL.D., Treasurer and V.P.R.S.
Received January 15, 1863.

My friend Mr. Crookes, the discoverer of the new metal thallium*, having kindly put into my hands a small quantity of the metal, which he believes to be chemically pure, I have been enabled to make some experiments upon its spectrum, the results of which may not be without interest to the members of the Royal Society.

Thallium, as is well known, when examined in the usual way by the spectroscope, yields a spectrum of remarkable simplicity, furnishing a single intense green line, the occurrence of which, as is familiar to chemists, led Mr. Crookes to the discovery of the metal, and suggested to him the name by which it is known. In order to try the effect of a progressively increasing temperature upon the spectrum furnished by the metal and its compounds, the following experiments were made.

* It has been made the subject of question abroad, whether Mr. Crookes or M. Lamy was the first to recognize the metallic nature of thallium, and thus to dispute the claim of Mr. Crookes to the full credit due to him for his investigation (with only about twenty grains of the element) of its leading characters where no previous clue existed to guide him. It may be sufficient to state in answer to this suggestion, that Mr. Crookes had exhibited it at the International Exhibition, and marked as *metallic* his scanty store, though in the form of a precipitate, in the beginning of May, unquestionably before M. Lamy had published anything relating to thallium.

Portions of metallic thallium, as well as of an alloy formed by fusing a bead of thallium upon the end of a platinum wire, and portions of the sulphate of the metal were introduced successively, first, into the flame of burning hydrogen, and then into the oxyhydrogen jet, and were in each case viewed by the spectroscope. As the temperature increased in intensity, the brilliancy of the thallium green line increased also, but no new lines made their appearance.

Two pieces of stout thallium wire were then arranged as electrodes to the secondary wire of an induction coil. A continuous torrent of sparks was maintained without melting the wires or producing very rapid oxidation, or volatilization of the metal; the light, however, was much whiter than its ordinary monochromatic character would have led us to expect. Mr. Crookes, who was with me during the experiments, projected the image of the points by means of a lens upon a distant white screen, when it was at once obvious that the extremities of the spark were of a fine green colour, whilst the flickering luminous arc, which filled up the interval, due chiefly to ignited air, was much whiter.

On viewing the sparks from the induction-coil by the spectroscope, several new lines, independently of well-marked air-lines, made their appearance. These lines were distinguished from air-lines by the peculiar character which distinguishes most metallic lines, viz. the much greater intensity of their extremities than of their central portions. Besides the usual intense line in the green, five others were particularly observable: first, a very faint one in the orange; next, two of nearly equal intensity in the green, more refrangible than $\text{Tl}\alpha$, with a third much fainter, these three lines in the green being nearly equidistant; whilst, 5th, in the blue was a bright well-defined line: all these were strong at each extremity and evanescent in the central portions.

The induction-spark of thallium was then observed when produced in a current of hydrogen gas. The air-lines disappeared, the peculiar lines of hydrogen were very manifest, particularly the line in the red and one of the lines in the blue; whilst the new thallium lines were preserved, with the exception of the feeblest, though all were reduced in intensity.

Finally, a photographic impression of the thallium spectrum upon collodion was obtained by the method which I have described in a

paper communicated to the Royal Society in June last. An impression extending to about division 154 of the scale then adopted was obtained. This spectrum contains several very characteristic groups of lines; it recalls the features of the spectra of cadmium and zinc, and less strongly that of lead.

Measuring by the scale already adopted in my former paper, it is found that there are two strong groups of lines at about 103 and 106. At 116, 121, and 126 are three groups—the first two less intense than the third, which is of about the same strength as the earliest two. Several feebler pairs of dots follow, and the spectrum terminates rather abruptly with four nearly equidistant groups, commencing respectively at 136, 141, 145, and 151. The first of these groups is very strongly marked, the others are fainter, but of nearly equal intensity.

The remarkable way in which a spectrum at low temperatures so simple becomes increased in complexity, both in the visible and in the extra-visible portions, is of high interest considered in relation to the physical cause of these phenomena; and it is not without interest in a chemical sense, from its bearing upon the view supported by Dumas, that thallium belongs to the alkaline group. Potassium and sodium exhibit no new lines in the induction-spark, merely a diffuse light filling up the air-lines, and lithium but a single strong group at about 124. This physical character, added to the more purely chemical ones of the insolubility of the sulphide, the chromate, the iodide, the sparing solubility of the chloride, the phosphate, the oxalate, the ferrocyanide, the occurrence of a powerfully basic oxide, and of a higher feebly acid oxide, may therefore assist in showing the resemblance of thallium to silver or to lead, which latter metal in density, colour, softness, and external appearance it so closely simulates.

It would be easy to point out other particulars in which the properties of thallium are in strong contrast with those of the alkali metals. The chemical energy of these metals, lithium, sodium, potassium, rubidium, and caesium, increases in the order mentioned, which is that of their equivalents. Thallium, with a higher equivalent than any of these, shows a greatly diminished chemical activity. The metal is readily reduced by zinc from its solutions. Its oxide, instead of being like that of all the alkalies, excessively deliquescent, is perma-

ment in air, and forms a closely adhering coat like that which is produced upon the surface of zinc or lead, protecting the metal beneath from further change.

In many points the chemical reactions of thallium resemble those of silver, to which metal it is also further approximated by the circumstance that the atomic heat of the metal, like that of silver, is double that of the series to which lead belongs. Although therefore in other physical properties thallium differs greatly from silver, it seems to be more closely allied to that metal than to any other.

January 22, 1863.

Major-General SABINE, President, in the Chair.

The following communications were read :—

I. “Researches on some of the Artificial Colouring Matters.—

No. I. On the Composition of the Blue Derivatives of the Tertiary Monamines derived from Cinchonine.” By A. W.

HOFMANN, LL.D., F.R.S. Received December 18, 1862.

The chemical visitors of the International Exhibition will not easily forget the magnificent collection of products displayed in the French court by M. Menier of Paris. Among these compounds, equally remarkable for their variety and beauty, the large crystals of cyanine, rivalling in splendour and purity Mr. Nicholson’s acetate of rosaniline, have attracted general attention. M. Menier, who has produced this new dye on a very large scale, has most liberally placed at my disposal some of the finest of these crystals for examination, hoping that their more minute investigation might perhaps lead to a method of giving solidity to this new colour, which in brilliancy and purity of tint is second to none of the several blues lately derived from coal-tar. The composition of cyanine and its mode of formation having hitherto remained unknown, I have gladly availed myself of this opportunity of performing some experiments with this interesting compound. I am sorry to say that, in a practical point of view, these experiments have failed entirely; but my studies have led me to some observations on this substance which, as a contribution to the history of cyanine, deserve to be recorded, and which I beg leave to communicate to the Royal Society.