## CHEMISTRY

### New Test for Alcohol

LIEBEN has discovered a new and very delicate test for the presence of alcohol, depending upon its conversion into iodoform. The liquid under examination is heated in a test-tube, into which are then introduced a few grains of iodine, and a few drops of potash-solution; whereupon, if alcohol is present, a yellow crystalline precipitate of iodoform is produced immediately or after some time, according to the degree of dilution of the liquid. This test is said to be capable of detecting 1 part of alcohol in 12,000 parts of water. For greater certainty, it is best to examine the precipitate with the microscope, iodoform exhibiting the appearance of hexagonal plates or six-rayed stars.

The test just described is capable of an important physiological application. It is generally supposed that alcohol introduced into the animal organism in the form of wine or other spirituous liquors becomes completely oxidised, and does not pass into the urine as alcohol, but in the form of some product of transformation. Lieben, however, by applying the new test to the urine of a man who had drunk a bottle of wine half an hour before, was able to detect the presence of alcohol in it. A second portion of urine voided by the same individual, an hour later, and a third, after another half-hour, still exhibited the peculiar reaction under consideration. The urine was of course distilled before applying the test, and it had been previously ascertained that none of the other volatile matters contained in it would produce a similar reaction.—[Ann. di Chim. app. alla Med., Sept. 1869, p. 136.]

### Preparation of Silver Nitrate

P. SCIVOLETTO proposes the following modification of the process of preparing silver nitrate for use in medicine, photography, &c. This salt is usually prepared from old silver containing copper, by dissolving the alloy in nitric acid, evaporating to dryness, and calcining the residue as long as nitrous fumes continue to escape. The product is a mixture of silver nitrate and cupric oxide, from which the former may be dissolved out by water. The inconveniences of this process are the time it takes, and the difficulty of ascertaining when the cupric nitrate is completely decomposed. To obviate these inconveniences, the author, after evaporating the solution of the mixed nitrates to dryness, redissolves them in water, and precipitates the silver from the neutral solution by means of a clean spiral of copper foil. The precipitated silver is then redissolved in nitric acid, and the resulting nitrate is either crystallised, fused, or left in solution, according to the use to which it is to be applied.—[Ann. di Chim. app. alla Med., August 1869, p. 70.]

A. SAYTZEFF has discovered a new method of converting fatty acids into the corresponding alcohols, namely, by the action of dry sodium amalgam on a mixture of a fatty acid with the corresponding chloride; e.g. acetic acid and acetyl chloride yield ethyl alcohol. In this manner he has prepared ethyl, propyl, and butyl alcohol.—[Zeitschr. f. Chem. (2), v. 551.]

GRUNE has found that the photographic image, as ordinarily produced, is on the surface, and not in the substance of the collodion film. By transferring the film to wood, and then dissolving out the collodion by means of ether, a purely metallic image is left, admirably suited for the purposes of the engraver.

## PHYSICS

### Thalen's New Map of the Spectra of the Metals

M. ROBERT THALÉN has contributed to the Royal Society of Upsala an important memoir on the determination of the wave-lengths of the metallic lines of the spectrum. Dissatisfied with the pure results of refraction, as not being sufficiently refined to meet the requirements even of ordinary analytical accuracy, the author resolved to construct a new chart, based on the principle of wave-lengths. For the systematic examination of spectra, an electric source of light should always be employed, and entire groups of characteristic lines ought to be observed in all cases. The ordinary spectroscope, with a fine micrometer scale, gives readings which vary sensibly with the temperature and material of the refractive medium; and two such instruments cannot be compared with each other unless by specific tables, or graphically. Accordingly, the highest accuracy can only be attained by direct comparison with the dark lines of the solar spectrum, which themselves furnish an excellent micrometric scale. M. Thalén has therefore founded his experiments on the laborious achievement of Ångstrom, with whose "normal solar spectrum" he was early associated.

The actual course of operations was as follows. Each bright metallic ray, whose spectrum it was desired to study, was laid down on the plates given by Kirchhoff and Hoffmann (A to G) or by Ångström and Thalén (G to H); these rays were next referred to Ångström's plates of the normal spectrum of the sun, unless a direct comparison with the solar lines could be made; and, lastly, the rays were drawn in the order of their wave-lengths as thus obtained, and sometimes with the assistance of a graphic method, on a map which accompanies the memoir.

The instruments employed in this research consisted of a large Ruhmkorff induction coil, aided by a sufficiently powerful condenser; and a voltaic battery of fifty pairs furnished the light for certain determinations. The spectroscope consisted of two tolerably large telescopes (one being used as a collimator) and a carbon disulphide prism of 60°. In favourable cases, two such prisms or six flint-glass prisms of 60° were employed; but when the intensity was very feeble, only one (of the latter kind) could be used.

The registration in the solar spectrum of the lines of incandescent bodies may be effected by different methods. When the voltaic arc is operated with, or even the induction spark (provided, in this case, that the electrode is made of the metal submitted to experiment), it is convenient to bring the rays from the two sources of light into the slit of the collimator in such a manner that the solar and metallic spectrum are one above the other. If the lines of the latter have sufficient intensity, the reference is effected without difficulty. On the other hand, when the intensity of the electric spectrum is feeble—which is generally the case when the spark is taken between electrodes moistened with saline solutions—it is better that the two pencils should enter the slit in the same direction, so as to be mutually superposed. As the bright lines are now scarcely visible on the illuminated background of the solar spectrum, the latter must be temporarily excluded by a screen; the vertical wire in the eye-piece of the telescope is made to coincide exactly with a bright metallic line; and then, on re-introducing sunlight, its position among the dark lines is seen with precision. It is not unworthy of notice that the exactness of this observation is impaired by a somewhat singular circumstance. If the wire and the Fraunhöfer lines are seen simultaneously in the focus of the eye-piece, the wire being placed among the weaker and narrower lines, it commonly happens that these entirely disappear, or can only be made out with difficulty. The great difference between the intensities of the two objects, and the diffraction fringes produced by the two sides of the wire, are, no doubt, the causes of this curious phenomenon.

M. Thalén gives a table in which the normal spectrum of the sun is recorded in wave-lengths, and compared with the refraction spectrum of Kirchhoff. By its aid, the metallic lines on the chart accompanying the author's paper may be identified with those of the refraction spectra alluded to, and an approximate value can be obtained of the wave-length corresponding to any line. The chart itself gives, in millimetres, the wave-lengths of metallic lines within about 0·0000001 of their true value. It was drawn by hand on paper upon which the scale had already been printed without the usual damping process; in this manner all shrinking was avoided. It is rendered still more valuable by a long appendix of tables, in which all its numerical elements are appropriately distributed among the respective metals. Only the most intense lines, such as are obtained by the induction apparatus, have as a rule, been submitted to measurement.

The following are the names of the metals whose lines coincide with those of the solar spectrum: sodium, calcium, magnesium, iron, manganese, chromium, nickel, cobalt, and *titanium*. The chart contains lines belonging to forty-five metals. Iridium, rhodium, ruthemium, tantalum, and niobium were examined, but without any definite result. The spectrum of air is given at the bottom of the chart, for the sake of reference, and some integers, roughly representing the intensity of the lines.

Some of the lines which show very strongly with metallic electrodes become very weak, when a saline solution is taken, and the more so as this is diluted. Two large and well-marked groups belonging to zinc and cadmium appear only when the metal itself forms the electrode, not the slightest trace of them appearing with a saline solution.

In a concluding note, M. Thalén points out the probable existence of titanium in the sun. Titanic oxide only gave feeble