formation of free hypochlorous acid occurs in a more striking degree when chlorine is sent through a solution of acetate of potash; that solution, it is well known, absorbs a large quantity of gas, and acquires the strong yellow color, the odor, and all the other properties of free hypochlorous acid. It is here evident, that by the action of chlorine upon acetate of potash, chloride of potassium is formed, with the bin-acetate of potash, free hypochlorous acid, and the hypochlorite of potash. If the large absorption of chlorine, by carbonate of potash, is due to carbonic acid, it follows that caustic potash should not absorb any excess of chlorine, but that the property should be confined to the carbonate. Accordingly, in two experiments, the proportion of chlorine, absorbed by caustic potash, was found to be as nearly as possible a single equivalent. In one experiment 449.1 chlorine, in the other 424.8 chlorine were taken up, instead of 442.6 chlorine, by a single equivalent, or 589.9 of potash. Caustic potash, therefore, dissolves no more chlorine than caustic soda. There appears, therefore, to be no reason to abandon the old theory, that the bleaching solutions of chlorine in alkalis and alkaline earths, contain a chloride and hypochlorite, for these bleaching compounds certainly do not correspond with metallic peroxides, as has been lately maintained.

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On some of the Substances contained in the Lichens employed for the preparations of Archil and Cudbear. By EDWARD SCHUNCK, Esq., Manchester.

Our knowledge concerning that department of organic chemistry which embraces the coloring matters, and other principles nearly allied to them, is of the most imperfect kind. Though many other branches of organic chemistry have been so thoroughly and accurately investigated, that little or nothing remains to be known concerning them, this may be called an unexplored field. Most of the coloring matters are so little known, as regards even their most essential characters, as not to allow us either to justify, or to question, the propriety of throwing them together into one general class; a class distinguished from those nearly allied to it merely by the (as far as we know) adventitious circumstance of the substances belonging to it, being endowed with certain more or less vivid colors. Among all the coloring matters, there are none, the study of whose properties and reactions is calculated to throw more light on the nature of the whole class, than those which are prepared by an artificial process from certain kinds of lichens, and on this account it is desirable that they should be carefully examined. It was the circumstance of these substances being prepared artificially from plants perfectly devoid of color, that first attracted to them the attention of chemists, and led to a series of investigations by which a number of highly interesting substances was brought to light, and a process elucidated which belongs to the most remarkable and unparalleled in the whole range of organic chemistry.

Robiquet first discovered a colorless crystalizable substance in them (orcin,) capable of being converted by the joint action of ammonia and oxygen into a true coloring matter, which contains neither the original substance, nor ammonia as such. This interesting discovery was followed by others. The researches of Heeren made us acquainted with a series of substances contained in the *Roccella tinctoria*, possessed of the same property, and another substance, phloridzin, was shown, by Stas, to bear a complete analogy to orcin, in this respect. The subsequent labors of Dumas, who subjected orcin, and the bodies derived from it, to an accurate examination, and of Kane, who has determined the composition of the substances discovered by Heeren, and of the coloring matters contained in archil and litmus, seemed to have sufficiently elucidated the subject. Some obscurities, however, in a part of Dr. Kane's late paper, seemed to make it desirable that some of his results should be confirmed before being finally adopted, and, at the suggestion of Professor Liebig, I undertook the reinvestigation of this subject, and performed it in his laboratory.

Instead of the *Roccella tinctoria*, I employed, in my experiments, the lichens that grow on the basalt rocks of the Vogelsberg, in Upper Hessa, where they are collected for the purpose of preparing a dye from them. These lichens were all crustaceous, and belonged to the genera *Lecanora*, *Urceolaria*, *Variolaria*, &c. From them I extracted the following substances:—

1. A white, crystalline substance, soluble in alcohol and ether, but insoluble in water, bearing in its properties great resemblance to the substance called by Heeren *Erythrin*, and by Kane *Erythrilin*, but different in composition, and giving other products of decomposition. This substance I call *Lecanorin*.

2. A crystalizable substance identical in properties and composition with Heeren's *Pseuderythrin*, and Kane's *Erythrilin*.

3. A fatty substance of acid properties, soluble in alcohol, but insoluble in ether and water.

The method by which these substances were extracted, and separated from one another, was the following:—

The lichens were reduced to a coarse powder, and then treated with ether, in an apparatus of displacement, until the ether dissolved nothing more. The ethereal extract, which had acquired a green tinge from chlorophyl in solution, was distilled off, leaving as a residue a greenish yellow mass, consisting, for the greater part, of lecanorin. This mass was brought into a glass funnel, and washed with small quantities of ether, until it had lost its green color in part. It was then treated with boiling water, in order to remove every trace of pseuderythrin, and, lastly, purified by dissolving it in a small quantity of boiling alcohol, which deposited, on cooling, a snow-white crystalline mass, consisting of lecanorin in a state of purity. The dark green ethereal fluid obtained by washing the impure lecanorin, contained, besides lecanorin, the greatest part of the pseuderythrin which had been extracted by the ether. The fluid was evaporated to dryness, and the residual mass treated with boiling water, which deposited, on cooling, a mass of shining plates and needles of pseuderythrin,

which was purified by recrystallization. More of this substance was obtained by treating the lichens, which had been exhausted with ether, with boiling alcohol, and filtering rapidly. The alcohol was distilled off, and the residue treated with boiling water, which dissolved all the pseuderythrin, and deposited it on cooling. The mass left undissolved was washed with ether, which dissolved all the chlorophyl, and left behind the fatty substance mentioned above, which was purified by redissolving in alcohol.

I will now proceed to a more minute description of the properties of these several bodies.

Lecanorin.—This substance, when pure, is perfectly white. If prepared in the manner described above, it has the appearance of a white mass composed of acicular needles. When its solutions are slowly evaporated, it crystallizes in silky needles grouped together in star-shaped masses. It is insoluble in boiling water, but soluble easily in alcohol and ether. Its solutions redden litmus paper. It is soluble in alkaline liquors, from which it is precipitated unchanged by acids, provided the solutions be not boiled, and be not left to stand too long. It is insoluble in all weak acids, with the exception of acetic acid. Strong nitric acid converts it ultimately into oxalic acid. It combines with metallic oxides by double decomposition. Heated on platinum foil it melts, emits a dense vapor, and burns off, leaving but little carbonaceous residue. When heated in a tube closed at one end, it melts, and, under violent ebullition, gives off a dense vapor, which condenses in the upper part of the tube into a thick liquid, which, after some time, solidifies, forming a crystalline mass. The nature of this sublimate will be explained further on.

The action of the alkalis on this substance, is, of course, the most interesting point connected with its history. A solution of lecanorin in ammonia, when exposed to the air, acquires, after some time, a beautiful deep purple color: from this solution acids precipitate a red coloring matter. A solution in potash, under the same circumstances, becomes of a deep red color. Being desirous of ascertaining whether the lecanorin was immediately converted into the red coloring matter, or whether it passed first through any intermediate state, which was not improbable, I dissolved some of the substance in ammonia, excluding the solution from contact with the air. After a lapse of some hours, the solution, though perfectly colorless, was found no longer to contain any lecanorin; for acids, instead of producing a thick gelatinous, or flocculent, precipitate, as they do when applied immediately after solution has been effected, merely caused a brisk effervescence of carbonic acid, plainly showing that the substance had been completely decomposed without a coloring matter having been formed. The same effect was brought about instantaneously when the solution was boiled. In order to observe the process more clearly, I dissolved a quantity of lecanorin in baryta water in the cold. The solution, on being boiled, or allowed to stand, deposited a great mass of pure carbonate of baryta. The liquid was filtered rapidly, and the excess of caustic baryta precipitated by a stream of carbonic acid: on slow evaporation, it yielded large prismatic crystals of a substance which

possessed characters in every respect identical with those of *orcin*. It had an extremely sweet taste, was capable of being volatilized without change, and without leaving any residue; gave a deep blue color when dissolved in ammonia, and exposed to the air, struck a blood-red color with nitric acid, and precipitated a solution of basic acetate of lead. Lecanorin thus is converted, by the action of alkalies, into orcin and carbonic acid, in the first instance, this decomposition always preceding the formation of coloring matters. The same decomposition is produced by the carbonated alkalies, by long boiling with water, and by dry distillation, the heavy vapor, mentioned above as being produced by heating lecanorin to decomposition, being vapor of orcin.

The composition of lecanorin is expressed by the formula $C_{18}H_8O_8$. The results of the combustions which I made of it, admit of no interpretation. All attempts to determine its atomic weight by means of combining it with metallic oxides, failed. These compounds can only be prepared by double decomposition; but the facility with which lecanorin is decomposed, when alkalies are added to its solutions, always renders the purity of the compounds formed liable to doubt. The compound with oxide of silver, formed by adding nitrate of silver to an alcoholic solution of lecanorin, and then precipitating by means of a few drops of ammonia, though it changed color but slightly in drying, gave no consistent results. The compound with oxide of lead, formed by precipitating a solution of lecanorin with basic acetate of lead, was so basic, and its formula so unusual, that I am led to suppose that one or two atoms of basic acetate of lead were precipitated together with it. By decomposing, however, a weighted quantity of lecanorin with caustic baryta, and determining the quantity of carbonate of baryta formed, I obtained very accurate results, confirming the formula $C_9H_4O_4$, or $C_{18}H_8O_8$, for lecanorin. In regard to the composition of orcin, I have been induced to replace the generally received formula, for its composition, by a new one. Dumas' formula for anhydrous orcin is $C_{18}H_7O_3$, and for crystalized orcin $C_{18}H_{12}O_8$, which evidently cannot be brought into accordance with the formula for lecanorin as given above. If, however, the formula $C_{16}H_6O_2$, be taken for anhydrous orcin, and $C_{16}H_{11}O_7$ for crystalized orcin, then the decomposition which lecanorin undergoes with alkalies, may be expressed as follows:—

Two atoms of water are furnished by the decomposition of the lecanorin itself, and three more by the fluid, to form from $C_{16}H_6O_2$ one atom of crystalized orcin, $C_{16}H_{11}O_7$. The combustions which I have made of this substance agree perfectly with these formulas, but Dumas' analyzes of the lead compound of orcin, which I have myself not yet examined, do not coincide with them, unless it be supposed

that this compound contains acetate of lead, either in chemical combination, or mechanically mixed.

In regard to the numerical results from which the above formulas have been deduced, I shall reserve them for a future occasion, when, having completed the investigation of the whole class of substances of which those here described are only a part, I shall be able to enter more minutely into details, and exhibit the facts and numbers brought to light in their proper connexion and order. I have merely been desirous of showing, on the present occasion, that our knowledge of this series of bodies is far from being complete. I have shown above, that the action of alkalis on lecanorin is two-fold; it consists, first, in abstracting from the substance carbonic acid, a process not requiring the co-operation of the oxygen of the atmosphere; secondly, in inducing, in contact with the air, the formation of coloring matters. The first action seems to have been overlooked in the case of all the bodies nearly allied to lecanorin. I have found the most complete analogy in the case of Heeren's pseuderythrin; and, if I am not mistaken in the interpretation of his statements, his erythrin also undergoes the same decomposition as lecanorin, for the former is converted into erythrin-bitter, by the very same agencies by which lecanorin is converted into orcin, and, in fact, there is the same relation in regard to all general properties between erythrin and erythrin-bitter, as between lecanorin and orcin. This circumstance is of some importance, for, in order to arrive at a knowledge of the exact composition of such complex bodies as the coloring matters formed by the action of alkalis on these substances, and to understand perfectly the nature of the process by which they are produced, it is absolutely necessary to know the exact substance out of which each is in the last instance formed, the last link of the chain which precedes its formation.

Pseuderythrin.—For this substance it would be advisable to substitute another name, as, in this case, the substance by which it is accompanied is not erythrin but lecanorin. It is contained in very small quantities in the lichens that I examined. It is sparingly soluble in cold water, but easily soluble in boiling water, from which it crystalizes, on cooling, in shining plates and needles. If more of the substance is taken than the boiling water can dissolve, the part left undissolved melts and collects at the bottom of the fluid in oily drops, which, on the temperature falling a little below 212° , congeal, and form crystalline masses. This is a characteristic property of pseuderythrin, and one distinctly mentioned by Heeren. It is easily soluble in alcohol and ether, and also in alkaline solutions. It gives compounds with metallic oxides by double decomposition. When dissolved in ammonia, and exposed to the air, it gives, like lecanorin, a red coloring matter; but its conversion into the latter is much more slowly effected than that of lecanorin. When subjected to dry distillation, it also gives a crystalline sublimate, accompanied by a copious disengagement of gas. When its solution in an alkali is boiled, or left to stand, some time, it imparts carbonic acid to the alkali, the decomposition being accomplished, however, with much more difficulty than with lecanorin. The exact nature of the substance left in solu-

tion, after this decomposition, I was unable to determine, on account of the very small quantity of pseuderythrin which I had at my disposal.

The combustions which I made of this substance confirmed the formula established by Liebig, at the time of Heeren's investigation, viz., $C_{20}H_{12}O_8$.

The *fatty substance* mentioned above, I have examined but slightly. It is soluble in alcohol, but insoluble in ether and water. From an alcoholic solution it is deposited in small pearly-white scales; if the solution be spontaneously evaporated, it is obtained in small, hard, shining, transparent crystals. It is soluble in alkalies, forming soapy solutions, and is reprecipitated by acids. Its alkaline solutions do not become colored when exposed to the air. It cannot be melted without being decomposed.

Ibid.

Iron Founding.—From the Glasgow Practical Mechanic and Engineer's Magazine.

(Continued from Vol. VI. Page 275.)

SECTION III.—ON DRY-SAND MOULDING.

The next branch of the subject which falls under consideration, is the manufacture of works in dry sand, usually called dry-sand moulding. This department embraces, generally, the manufacture of pipes, columns, shafts, and other long bodies of a cylindrical form, or approaching to it. Dried, or baked sand, as was formerly stated, consists of loam called pit sand, that has already been used in structures of loam work, mixed with fresh sand. Dry sand acquires a very firm and open consistence by the expulsion of its humidity by heat, and it is found to be much better adapted to the purposes above mentioned than green sand.

The mechanical part of the process of moulding in dry sand, is the same as in the case of green sand work. In general, no coal powder is mixed with this sand. When the mouldings are finished they are transferred to drying stoves, in which they are exposed twelve hours, or upwards, as occasion requires, to the action of a strong heat till their humidity is banished. The experience of the moulder must be his guide in so mixing the materials at his disposal, as to produce the most accurate form of mould when finished, which shall also be sufficiently porous. Such moulds permit a readier egress for the gases generated by the casting, than green sand; generally, also, the castings turned out are less vesicular, and smoother upon the surface.

When the castings are large, and especially if they are tall, the hydrostatic pressure of the metal upon the sides of the mould is counteracted, both by the firmness of the sand, and by the wedge-shaped form of the boxes. To aid the resistance, the sides are feathered along the outside, affording additional abutting surface for the sand. Fig. 1, is a view of one half of a moulding box for pipes, the other half being an exact counterpart. Fig. 2, is a cross section, showing parallel sides. Fig. 3, is a similar section of a wedge-shaped box for