Dr. Bostock [1], the constituents of 100 parts of the saturated solution are 23·1 of oxide of lead, 5 of acetic acid, and 71·9 of water, which agree with the statement of Thenard [2], who found that the salt, when crystallized, consists of 17 parts of acid, 78 of oxide of lead, and 5 of water, in 100 parts. [3]

Medical properties and uses. — This solution is used only externally, and when diluted with *distilled* water forms a very useful, cooling, discutient application to phlegmonous inflammations and burns. It was introduced into practice by M. Goulard, a surgeon of Montpelier; and thence its appellation of Goulard's Extract.

LIQUOR PLUMBI SUBACETATIS DILUTUS, Lond. *Diluted Solution of Subacetate of Lead.* [4]

"Take solution of subacetate of lead, *a fluid drachm;* distilled water, *a pint;* proof spirit, *a fluid drachm.* Mix."

PLUMBI SUBACETATIS LIQUOR COMPOSITUS, Dub. *Compound Solution of Subacetate of Litharge.*

The same as the London formula, with double the quantity of each of the ingredients.

This preparation, as an article in the Pharmacopœia, is superfluous, every surgeon being in the habit of ordering lotions with different proportions of the solution of subacetate of lead, according to the circumstances of the case.

PRÆPARATA E ZINCO.

PREPARATIONS OF ZINC.

CALAMINA PRÆPARATA, Lond. *Prepared Calamine.*

"Calcine the calamine, and beat it to powder; then bring it into the state of a very fine powder, in the manner directed for the preparation of chalk."

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[1] *Nicholson's Journal*, xi. 75. [2] Ibid. vi. 223.

[3] The nature of the salt in this solution was first pointed out by Scheele, who changed a solution of the acetate of lead into Goulard's extract, by keeping it in a plate of lead for the space of a day; but this experiment was overlooked until Dr. Bostock's analysis of the preparation. An excellent mode of preparing it is employed in the French hospitals. Three parts of acetate of lead is dissolved in a sufficient quantity of hot distilled water, and to the solution one part of semi-vitreous oxide of lead is added, in fine powder. The whole is then evaporated until it marks 28° of Beaumé's areometer; and when cold, is filtered. Vide *Journ. de Pharm.* Dec. 1816. p. 565.

[4] Aqua lithargyri acetati composita, P. L. 1787.

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CARBONAS ZINCI IMPURUS PRÆPARATUS, Edin. *Prepared impure Carbonate of Zinc.*

"Impure carbonate of zinc, roasted by those who make brass, being rubbed to powder in an iron mortar, and levigated with a little water on a porphyry, is to be put into a large vessel, and water poured over it, which, after frequently agitating the vessel, is to be poured off loaded with the powder. The fine powder, which subsides after the water has remained at rest, is then to be dried. The coarse, which the water cannot suspend, is to be again levigated, and treated as before."

ZINCI CARBONAS IMPURUM PRÆPARATUM, Dub. *Prepared impure Carbonate of Zinc.*

"Reduce calcined calamine-stone to powder, and separate the very fine parts in manner directed for the preparation of chalk."

Syn. Calamine preparé (*F.*), Galmei (*G.*), Kalmei (*Dutch*), Galmija (*Russ.*), Calamina (*I.*), Calamina (*S.*).

The nature of this ore of zinc has been already stated. (Part ii.) As it is frequently used in the form of a dry powder to excoriations, ichorous ulcers, and superficial inflammations, dusted on the part, it requires to be rendered extremely fine.

Officinal preparations. *Ceratum Calaminæ*, L. E. *Unguentum Calaminaris*, D.

OXIDUM ZINCI IMPURUM PRÆPARATUM, Edin. *Prepared impure Oxide of Zinc.*

"It is prepared in the same manner as the impure carbonate of zinc."

This substance, the nature of which has been already stated (Part ii.), is used for the same purposes as the former article.

ZINCI OXYDUM, Lond. *Oxide of Zinc.*[1]

"Take of sulphate of zinc, *one pound*; solution of ammonia, *one pint*, or *as much as may be required*; distilled water, *one pint*. Dissolve the sulphate of zinc in the distilled water, and add as much solution of ammonia as may be requisite to precipitate the oxide of zinc entirely. Pour off the solution; wash the powder repeatedly with distilled water, and dry it upon a sand bath."

OXIDUM ZINCI, Edin. *Oxide of Zinc.*

"Let a large crucible be placed in a furnace filled with burning coals, in such a manner as to be somewhat inclined

[1] The ancients, who were acquainted with it, called it Pompholyx; and by the early chemists it was named *Nihil album*, *Lana philosophica*, and *Flores Zinci*. Zincum calcinatum, P. L. 1787. In Holland it was prepared as a secret remedy, and sold under the names *Arcanum Ludemanni* and *Luna fixata*, until Gaubius made public its composition.

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to its mouth, and when the bottom of it is heated to a moderate degree of redness, throw into it a piece of zinc about the weight of one drachm. The zinc is soon inflamed, and converted into white flocculi, which are occasionally to be removed from the surface of the metal by means of an iron spatula, that the combustion may be more complete; and when the inflammation is over, remove the oxide of zinc from the crucible. Throw in then another piece, and let the operation be repeated as often as is necessary. Finally, let the oxide of zinc be prepared in the same manner as the impure carbonate of zinc."

Dublin.

"Take of zinc broken into small pieces, *any quantity.* Throw these, at intervals, into a sufficiently large crucible, heated to whiteness, and placed with its mouth inclined towards the mouth of the furnace. After each piece of zinc is thrown in, invert over the crucible another crucible, but loosely, so as not to exclude the air. Preserve the light, very white, sublimed powder for use."

Syn. Oxide de Zinc (*F.*), Weisser Zinkoxyd (*G.*), Per Ossido di Zinco; fiori di Zinco (*I.*).

In the process of the London College, too small a quantity of water is ordered for the solution of the sulphate of zinc. It is requisite not to add too much ammonia, as it re-dissolves the precipitates. Mr. Brande properly remarks, that the quantity of water ordered is too small, and that the word *congium* should be sustituted for octarium.[1] In the two other processes the crucible must be heated above 700° of Fahrenheit, which is the point of ignition of zinc. At this temperature the metal inflames, burning with a dazzling white and green flame; and by attracting the oxygen of the air is converted into a white oxide, which is partly volatilized in the form of very light flocculi. The elevation of these flocculi, however, is owing to the current of air excited by the force of the combustion; for the oxide itself is not volatile, but accumulates in the crucible so rapidly, that it must be withdrawn to allow the access of the air for keeping up the combustion. If the crucible be sufficiently capacious, there is no necessity for covering it with another, by which the operation is always impeded.[2]

Qualities. — Oxide of zinc thus prepared is inodorous, insipid, of a pure white colour, infusible in the fire, insoluble in

[1] *Manual of Pharmacy*, p. 313.

[2] This oxide may also be readily prepared by dissolving zinc in diluted sulphuric or nitric acid, and precipitating by potassa, a process proposed by Marabelli, professor of pharmacy at Pavia, in 1798. The washed precipitate is oxide of zinc, containing, according to Vauquelin, 0·21 of oxygen.

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water and alcohol, but entirely soluble in acids, and is not altered by exposure to the air. According to Proust 100 parts of it consist of 80 of zinc, and 20 of oxygen; or 100 zinc + 25 oxygen. It often contains small portions of carbonic acid.[1] It is often adulterated with chalk, and sometimes contains white lead. By pouring sulphuric acid on the specimen, the first is discovered by the effervescence which is excited, the second by an insoluble sulphate of lead being formed.

Medical properties and uses. — Oxide of zinc is tonic and antispasmodic; and has been advantageously used in chorea, epilepsy[2], and some other spasmodic affections. It has been employed in hooping-cough on the Continent; and Lœffler recommends it to be used externally as well as internally in that disease. He employs a liniment composed of linseed oil and oxide of zinc. It is chiefly used as an external application. (See *Ung. Zinci.*)

The dose, as an internal remedy, may be from gr. j. to grs. vj. given twice a day.

Officinal preparation. *Unguentum Zinci*, L. E. D.

ZINCI SULPHAS[3], Lond. *Sulphate of Zinc.*

"Take of zinc, broken into small pieces, *four ounces;* sulphuric acid, by weight, *six ounces;* water, *four pints.* Mix them in a glass vessel, and the effervescence being over, filter the solution through paper; then boil it until a pellicle begin to form on the surface, and set it aside to crystallize."

Edinburgh.

"Take of zinc cut into small pieces, *three parts;* sulphuric acid, *five parts;* water, *twenty parts.* Mix them, and the effervescence being finished, digest for a short time on hot sand. Then filter the decanted solution through paper, and after due evaporation, set it apart that crystals may be formed."

Dublin.

"Take of zinc reduced to small pieces, *thirteen parts;* sulphuric acid, *twenty parts;* water, *one hundred and twenty parts.* Pour the acid previously diluted with the water upon the zinc; put into a glass vessel; digest for a short time after the effervescence ceases; then evaporate the strained solution, to a proper point, and set it aside to crystallize."

Syn. Sulphate de Zinc (*F.*), Schwefelsaures Zink (*G.*), Solfato di Zinco (*I.*), Vitriolo bianco (*S.*).

The directions of the Dublin College for granulating the

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[1] *Annales de Chimie*, xxxv. 51. The more recent experiments of Dr. Thomson make the proportions to be metal 100 + 24·16 oxygen; those of Berzelius, metal 100 + 24·4 oxygen.

[2] *Duncan's Med. Comment.* iii. 216.

[3] Zincum vitriolatum, P. L. 1787.

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zinc are to be adopted in preference to those of the other colleges for dividing it. In these processes, the acid enables the zinc to decompose the water, and the metal is oxidized by attracting its oxygen, while its hydrogen is disengaged with effervescence. The oxide thus formed combines with the acid, forming sulphate of zinc, which is obtained in crystals by the subsequent evaporation. The greater part, however, of the sulphate of zinc of the shops is prepared on a large scale, and purified in the manner that shall be immediately noticed. It is denominated *white vitriol* in the language of commerce, and is manufactured largely both in Germany [1] and England. In Germany it is prepared by exposing roasted blende to the air and humidity; by which means the metal is gradually oxidized, and combined with the sulphuric acid also formed from the sulphur contained in the blende. The sulphate thus produced is separated from the earthy parts of the blende by lixiviation, and after being boiled down is crystallized, or rather concreted, into hard, granular masses, resembling loaf-sugar, which generally contain sulphate of iron, of lead, and sometimes of copper. In England it is prepared generally by the direct combination of its constituents; but although purer than the foreign salt, yet the English white vitriol, almost always, contains iron. Both kinds are purified by solution in water, and then allowing the solution to evaporate very slowly in an open vessel, containing some granulated zinc; the sulphate of lead will subside, and the other foreign salts be decomposed by the metallic zinc. The purified sulphate of zinc may be then crystallized by lixiviation and evaporation.[2]

Qualities. — Pure sulphate of zinc, or rather *supersulphate*, for it contains an excess of acid, and reddens the vegetable blues, is inodorous, and has a slightly acidulous, styptic, metallic taste. It crystallizes in transparent, colourless, right rhombic prisms [3], terminated by quadrangular pyramids; effloresces slightly in the air; is soluble in 2·5 times its weight of water at 60°, and in less than its own weight of boiling water. It is decomposed by the alkalies, earths, and hydrosulphurets; and throws down a dirty-looking precipitate from astringent vegetable infusions, with which, therefore, it is incompatible in prescriptions. According to the analysis of Dr. Wollaston, the constituents of 100 parts of the pure crystallized salt are 28·4 of oxide of zinc, 27·3 of acid, and 44·3

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[1] Beckman, in his History of Inventions, says, it was first made at Ramelsberg, in Germany, about the middle of the 16th century. He ascribes the invention to Julius, Duke of Brunswick.

[2] *Aikin's Dictionary of Chemistry.* [3] *Phillips's Trans. of the Pharm.* 1824.

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of water. Mr. Phillips makes the proportions to be 30·9 of oxide of zinc, 29·4 of acid, and 30·7 of water.

Medical properties and uses. — Sulphate of zinc is tonic and astringent, and in large doses emetic. As a tonic, it is less heating and stimulant than sulphate of iron, and thence is preferable in phthisis, and other diseases attended with great irritability and general weakness. It is also useful in dyspepsia, fluor albus, and some convulsive affections, as pertussis, chorea, and epilepsy; in which diseases it is generally combined with myrrh, bitter extracts, opium, extract of hemlock, or digitalis, according to the circumstances of the case. As an emetic it operates almost instantaneously, and, therefore, is often employed to empty the stomach at the commencement of the paroxysm of intermittent fever, and in other cases in which quick vomiting is required. In large doses it is poisonous.[1] As an external application, this salt dissolved in rose-water, in the proportion of grs. ifs. to f ℥j. of rose-water, forms an excellent collyrium in the latter stage of ophthalmia, after the inflammatory action has subsided; it is a good injection in a similar stage of gonorrhœa; and a lotion in some kinds of superficial inflammations. In double the strength, this solution is the best application that can be used to scrofulous tumours, after they have suppurated, and the abscess has been discharged.

The dose to produce vomiting is from grs. x. to ʒss. and as a tonic from gr. j. to grs. ij. may be given twice a day.

Officinal preparations. *Solutio Sulphatis Zinci*, E. *Liquor Aluminis compositus*, L. *Solutio Acetatis Zinci*, E. D.

SOLUTIO SULPHATIS ZINCI, Edin. *Solution of Sulphate of Zinc.*

"Take of sulphate of zinc, *sixteen grains;* water, *eight ounces;* diluted sulphuric acid, *sixteen drops.* Dissolve the sulphate of zinc in the water, and having added the acid, filter the solution through paper."

This formula is given under the idea of the common sulphate of zinc, (which often contains some excess of oxide, and some oxide of iron,) being employed. The superabundant oxide, if present, is dissolved by the acid, so that a solution of an uniform strength is always obtained. It is rather too strong for the purposes of a collyrium in chronic ophthalmia; and the addition of the acid renders it less fit to be used as an injection in gonorrhœa.

SOLUTIO ACETATIS ZINCI, Edin. *Solution of Acetate of Zinc.*

"Take of sulphate of zinc, *one drachm;* acetate of lead,

[1] It is a singular fact that the Aranea *scenica* devours sulphate of zinc, and deprives it of its acid.

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four scruples; distilled water, *twenty ounces*. Dissolve. Mix the salts separately in ten ounces of the water; then mix the solutions, and after the precipitate subsides, filter."

Syn. Dissolution d'Acetate de Zinc (*F.*). Liquore de l'Acetato di Zinco (*I.*).

In this process a double decomposition takes place: the sulphuric acid of the sulphate of zinc unites with the oxide of lead of the acetate of lead, whilst its acid combines with the disengaged oxide of zinc. The former salt being insoluble, is precipitated in the form of a heavy, white powder, but the acetate of zinc remains dissolved; and thus its solution, which is colourless and limpid, is easily separated by filtration.

Medical properties and uses. — This solution is astringent; and was long employed before it was introduced into the Pharmacopœia, and even before its nature was clearly understood. It is an useful collyrium in chronic ophthalmia, and in the acute variety of this disease, after the inflamed vessels are unloaded, and the inflammatory action subdued. It is also an useful injection in the advanced stage of gonorrhœa.

TINCTURA ACETATIS ZINCI, Dub. *Tincture of Acetate of Zinc.*

"Take of sulphate of zinc, acetate of potassa, of each, *one part*. Rub them together, and add of rectified spirit of wine, *sixteen parts*. Macerate for a week, with occasional agitation, and filter through paper."

In this process, a double decomposition also takes place, acetate of zinc and sulphate of potassa being produced; the former of which is dissolved in the spirit, while the latter remains undissolved, and, therefore, is easily separated. It is a tedious process, and possesses no advantages over the former to recommend it.

Medical properties and uses. — This tincture is astringent; but requires to be diluted with water, before it can be used either as a collyrium or an injection. It might be advantageously employed as an internal remedy in dyspepsia, and other debilities of the stomach.

PREPARATIONS OF SULPHUR.

PURE SULPHUR is generally regarded a simple substance; but, according to Sir H. Davy's experiments, it is a triple compound of oxygen, hydrogen, and a peculiar, unknown base. It unites readily with metals, some oxides, earths, and the fixed alkalies, forming compounds which have been denominated *Sulphurets*. These are formed by the fusion of the substances in a dry state; and the compounds require to be

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