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M.H. Deville

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estimate, but it has been immense, and the coming season it will doubtless be greater. New and rich deposits are developing every day. Accounts from various points in the mining district, represent the gold as very abundant, more so if possible than last year—individuals even early in the season obtaining often from three to ten or even twenty ounces a day. The diggings on the several forks of the Rio de los Americanos, the Stanislaus, the Tuwalumnes, the Merced, the Mariposa, King's river (Lake Fork on Fremont's new map), and in many other places, are represented as peculiarly rich.

There was one specimen of gold mingled with quartz, found near Stanislaus last autumn, which I had resolved to procure, if possible, for the cabinet of Yale. It was irregular in form, about four inches in diameter, and weighed $5\frac{1}{4}$ pounds avoirdupois. The metal was interspersed in irregular masses through the stone, and as near as I could judge without special investigation, was equivalent to about two pounds troy, perhaps a little more. Other specimens much larger are said to have been found, and one of twenty pounds weight pure, near the Stanislaus; but these I have not seen.—Silliman's *Journal,* November 1849.

COMBINATIONS OF OIL OF TURPENTINE AND WATER.

BY M. H. DEVILLE.

Oil of turpentine and some isomeric compounds have the property of combining with water, to form substances which well deserve the name of *hydrates,* on account of the facility with which this water may be separated from them. But some singular reactions which occur entitle them to be regarded as compounds of a very peculiar order, and which are without analogy in the history of products of the same kind.

These bodies lose a part of their combined water by the action of heat or exposure to a dry vacuum, and they regain it by exposure to a moist atmosphere.

The action of reagents seems to indicate, at least with oil of turpentine, that the hydrate does not contain the primitive oil in combination. The compound of camphor, obtained by means of hydrate of turpentine and hydrochloric acid, is a proof of this. It will also be seen, that this property has allowed of the conversion of oil of turpentine into oil of lemons, or at any rate into a substance which has all its chemical properties and characteristic odour.

It has long been known that the oils of turpentine and lemon sometimes deposit crystals which, as regards composition, differ from the oil only by the presence of six equivalents of water. These are the results to which the only good analyses that have been performed, lead. They are those of MM. Dumas and Peligot, who, in point of fact, found the formula of the crystalline bodies of oil of turpentine and cardamom, &c. to be $C^{20}H^{22}O^{6} = C^{20}H^{16}, H^{6}O^{6}$.

Some years since M. Wiggers observed that in certain veterinary medicines formed of a mixture of alcohol, nitric acid, and oil of turpentine, there was deposited a considerable quantity of a crystallized

substance, which possessed the composition of the hydrates analysed by MM. Dumas and Peligot.

M. Deville continued the researches of M. Wiggers, and found that, to obtain the hydrate of oil of turpentine in a short time, the most convenient substances and proportions were, 4 litres of commercial oil of turpentine, 3 litres of alcohol at 85°, and 1 litre of common nitric acid. At the expiration of a month or six weeks 250 grammes of very pure crystals were obtained, and eventually more than a kilogramme was gradually deposited. The oils of lemon and bergamot yield the same results when similarly treated. Oil of copaiba with nitric alcohol acquires much colour, and after a long time yields so small a quantity of crystals, that they could not be analysed.

If a mixture be made of oil of turpentine and crystallizable acetic acid, no effect is produced even in several years; but if a few drops of nitric acid be added to the mixture, solution takes place in a few days, and crystals are soon deposited. On putting the liquid *in vacuo* over a vessel full of potash, and another full of sulphuric acid, the vapour of water, of nitric and acetic acids, and of oil of turpentine is absorbed, and there remains a blackish paste, from which, by means of alcohol, there may be extracted crystals of the same form and composition as those obtained with nitric alcohol.

The action of the nitric acid in the combination of water with the oils it is very difficult to determine. It is to be remarked that the acid does not increase the solubility of the oil in the alcohol, but on the contrary, diminishes it. Neither dilute alcohol, alcohol almost absolute, nor alcohol acidified with nitric acid, had any effect on oil of turpentine after having been mixed with it for several years. Pure water and these oils combine, however, though very slowly, and in small quantity but regularly, in vessels in which the oils are kept impregnated with moisture. The crystals thus produced, although possessing the same composition as those deposited from nitric alcohol, differ considerably from them in form, as will be seen hereafter. It is also to be remarked, that the hydrate of oil of turpentine, which is formed in a mixture of acetic and nitric acid, assumes a form which is sensibly different from that which it has after solution in and crystallization from alcohol.

The author states that he should have been curious to examine these various compounds which so resemble each other, and which are perhaps dimorphous and chemically identical. Unfortunately it is very difficult to procure the hydrate formed accidentally in old oils, that is to say, the product analysed by MM. Dumas and Peligot, so that all hope of obtaining it in sufficient quantity, even for an imperfect examination, was relinquished.

Hydrate of oil of turpentine is one of the most beautiful substances obtainable, on account of its size, perfection, limpidness and splendour of its crystals, which are right prisms with rectangular bases.

This substance exerts no action on the plane of polarization; it fuses from 217° to 221°, losing a little water; when exposed to a

higher temperature its composition changes. When it has been melted it does not perfectly solidify on cooling, but remains soft, and may be drawn into threads at common temperatures. It is at first transparent, and then after some time it becomes a mass of radiating crystals. At 50° Fahr. 100 parts of alcohol of 85° dissolve 14·49. Its composition, as well as that of the hydrates of oil of lemon and bergamot, is as follows:—

	Experiment			
	I.	II.	III.	
Carbon.....	63·2	62·9	63·0	Calculation ($C^{20}H^{22}O^6$)
Hydrogen ...	11·7	11·7	11·7	
Oxygen	25·1	25·4	25·3	
	100·0	100·0	100·0	

When hydrate of oil of turpentine is heated to a higher temperature than that at which it melts, it is very rapidly decomposed into water and a new hydrate, not containing more than two equivalents of water, and which almost entirely evaporates; the residue is inappreciable.

It will be remembered that MM. Blanchet and Sell have found and analysed a substance obtained from oil of turpentine, to which they have assigned the formula $C^{20}H^{16}H^2O^2$. In the nomenclature adapted to these series of compounds, the name of *monohydrate* of oil of turpentine ought to be given, as well as to the product derived from distilling the hydrate obtained from the action of nitric alcohol on oil of turpentine; M. Deville gives the name of *perhydrate* to the crystals collected in moist oil of turpentine or treated with nitric alcohol.

Heat is not the only agent which is capable of converting the terhydrate of oil of turpentine into bihydrate; the same effect is produced by a dry vacuum. Moreover, the terhydrate is reproduced, when, after having lost, by either mode, 2 equivalents of water, it is left exposed for some time to moist air. This singular reaction is probably unparalleled in organic chemistry: it is surprising to observe a substance which is totally insoluble in water, like the bihydrate of oil of turpentine, absorb water from a moist atmosphere, as is shown by the result of quantitative analyses performed with care.

The following are the results of an analysis of the bihydrate, recently prepared by means of many distillations:—

	Experiment.	Calculation. ($C^{20}H^{20}O^4$)
Carbon.....	69·4	69·76
Hydrogen ...	11·8	11·63
Oxygen	18·8	18·61
	100·0	100·00

The density of the vapour confirmed this formula; by experiment it was 6·257, by calculation 6·01; the bihydrate possesses no acid reaction; when heated with potash, it is volatilized and does not combine with it, although its composition would lead to the con-

clusion that it would have the properties of a fatty acid; it boils fixedly at 282° Fahr.; it is volatile without residue.

When oil of turpentine is treated with nitric alcohol, another substance is obtained which may be considered as a liquid hydrate. After remaining mixed for several years, these substances do not dissolve, and the oil of turpentine is not entirely metamorphosed. On heating the viscid and coloured oil which floats on the nitric alcohol to 428° Fahr., water first comes over, then oil of turpentine, afterwards a peculiar liquid, into the composition of which, judging from the results of analysis, the elements of water enter; it is probably only impure liquid bihydrate of oil of turpentine; it yielded by analysis,—

Carbon.....	76·4
Hydrogen	11·6
Oxygen	12·0
	100·0

By analogy it ought to be admitted that a liquid terhydrate cannot exist at 292° Fahr. If it be supposed that an oil be present in this product representing a liquid hydrate, its composition must be,

C^{20}.....	69·8
H^{20}.....	11·6
O^{4}.....	18·6
	100·0

This formula is that of the solid bihydrate of oil of turpentine.

It appears from the above detailed experiments, that oil of turpentine forms with water three very distinct compounds :—

$C^{20}H^{16}$, $H^{6}O^{6}$
$C^{20}H^{16}$, $H^{4}O^{4}$
$C^{20}H^{16}$, $H^{2}O^{2}$ (Blanchet and Sell).

The two first may be converted into each other at pleasure, since a dry vacuum takes away 2 equivalents of water from the terhydrate, and moist air restores 2 equivalents of water to the bihydrate.—*Ann. de Ch. et de Phys.* Septembre 1849.

ACTION OF PHOSPHORIC ACID ON THE HYDRATES OF OIL OF TURPENTINE. BY M. H. DEVILLE.

When the bihydrate or terhydrate of oil of turpentine is treated with anhydrous phosphoric acid, a colourless oil is obtained, which by distillation is separated into two other oils of different volatility: one is tereben, easily recognized by its odour, fluidity and composition. It gave by analysis—

	Experiment.	Calculation. ($C^{20}H^{16}$)
Carbon.....	88·1	88·24
Hydrogen.....	11·9	11·76
	100·0	100·00

The other oil is viscid, boils at a higher temperature, and is more dense than the above; it possesses characteristic dichroism, sometimes appearing blue and at other times colourless: it is colophen.