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CXV.—Sodium Nitrososulphate. By Edward Divers, M.D., F.R.S., and TAMEMASA HAGA, D.Sc., F.C.S.

PELOUZE (Ann. Chim. Phys., 1835, [2], 60, 151; Annalen, 1835, 15, 240), in attempting to prepare sodium nitrososulphate, found it to be far more soluble than potassium or ammonium nitrososulphate, and therefore difficult to prepare. As its general properties in solution seemed to be the same as those of the potassium salt, he did not proceed to isolate it or to examine it further.

The potassium and ammonium salts crystallise out when a fairly concentrated solution of the respective sulphite, along with some excess of alkali, is submitted to the action of nitric oxide, but this is not the case with the sodium salt, which can only be obtained by evaporating the solution left after acting on sodium sulphite with nitric oxide. We prepared it by exposing for five days, at about the mean temperature, to an atmosphere of nitric oxide, a very concentrated solution of normal sodium sulphite, to which, as a preserva-

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tive, one-fortieth of its weight of sodium hydroxide had been added; it was contained in a connected series of Erlenmeyer flasks, the layer of liquid being shallow. For half this time, the gas was under the additional pressure of a column of water, and for the rest of the time at the barometric pressure only. The flasks were occasionally shaken, but as no incrustation was formed on the surface of the solution, agitation was less useful than in making the potassium or ammonium salt.

At the end of five days, the solution was effervescing slightly, indicating that the salt was undergoing decomposition. Hardly any sulphite then remained, and nearly all the sulphate which had formed or been present at starting was crystallised out by keeping the solution for some time at a little below zero; this was removed, and the solution quickly evaporated in a vacuum desiccator to a very small volume, by which time it had deposited opaque white crusts and minute hard crystals, perfectly transparent under the microscope. These, which proved to be nitrososulphate, were placed on a porous tile and drained dry; the salt then formed a crystalline powder, tasting remarkably like common salt, slightly alkaline to litmus, and free from sulphate and sulphite. It was weighed and then left for a night in a desiccator, to see what it would lose in weight as moisture and water of crystallisation; next morning it appeared to be unchanged, and was placed on the balance-pan between watch-glasses, but it could not be weighed because it rapidly lost weight. Taken from the balance and uncovered, it had not been a minute exposed to the air before it began to have a nitrous odour, and then quickly grew very hot and evolved much nitrous oxide mixed with nitric oxide. The watch-glass which held the salt was broken, and the wood of the table on which it rested was scorched by the heat. The powdery solid residue of the decomposed salt, consisting of sulphate and sulphite, was collected, with hardly any noticeable loss, and weighed. Its weight was 5.645 grams, while the nitrososulphate as placed in the desiccator had weighed 7.595 grams. In portions of the residue we determined its sodium by ignition with sulphuric acid, its sulphur by oxidation with bromine water and precipitation with barium chloride, and its sulphite by titration with iodine. These were all calculated as parts per cent. of the salt before it was placed in the desiccator. The numbers found show a deficiency of about 3 per cent. from those for the anhydrous salt, whilst sodium nitrososulphate with 1H₂O would have lost 8.8 per cent. in becoming anhydrous. The tabulated numbers are given. No N SO with

	Na ₂ N ₂ SO ₅ .	Found.	3 p. c. deficient.
Sodium	24.73	24.13	23.99
Sulphur	17.20	16.64	16.68

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This deficiency includes moisture, and any solid particles carried away during the very rapid evolution of gas by the salt when decomposing. From the weight of the residue and that of the sulphite it contained, it can be calculated, approximately at least, that about 1.6 per cent. of the original salt, or 1.2 per cent. of sulphate and sulphite, were mechanically lost by the decomposition of the salt, and, therefore, that when placed in the desiccator, it had contained about 1.4 per cent. of moisture. Now, the amount of sulphite in the residue was 9.8 per cent. of it, or 7.28 per cent. of the damp nitrososulphate. Therefore, to recompose the salt, we have

Sodium sulphite	7 ·28	
Nitric oxide equivalent to this	3.42	
Sodium sulphate	67.05	
Nitrous oxide equivalent to this	20.78	
Moisture, by difference	. 1.42	
	100.00	

Sodium nitrososulphate is, therefore, an anhydrous salt, like the potassium salt. Like the potassium salt also, although it continuously decomposes into sulphate and nitrous oxide when in neutral solution, it can be heated moderately with very little change, if some sodium hydroxide is present; when, however, such an alkaline and somewhat concentrated solution is boiled, it rapidly decomposes into sulphite and nitric oxide, and this the potassium salt does not do.

It thus seems that the reversion of nitrososulphates into nitric oxide and sulphite is dependent on temperature alone, and is not prevented by the presence of water. It is otherwise with their decomposition into nitrous oxide and sulphate, which is caused either by water alone, or by elevation of temperature alone; for at the common temperature they can be kept for an apparently indefinite time when dry, but decompose in damp air or in solution; on the other hand. when heated, even in dry air, they generally decompose much more in this way than into nitric oxide and sulphate. One exception to this is the potassium silver salt, which, when heated, gives only nitric oxide and sulphite (Hantzsch). This fact points to the latter decomposition as the primary effect of heat in all cases, and to the production of sulphate and nitrous oxide as the result of the interaction of nitric oxide and sulphite. Potassium silver sulphite not being readily oxidisable, this interaction does not occur when potassium silver nitrososulphate decomposes.

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