

and the residue ignited to burn off the bitumen. The residue, with the dish, is weighed after cooling in a desiccator, and the amount found is added to the weight of the weighing-bottle, thimble and its contents (after extraction).

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Strontium Malate.—There seems to be no agreement as to the composition of strontium malate. Hagen¹ states that it contains one and a half molecules of water of crystallization and crystallizes in warts. Castoro² obtains the salt in needles with four molecules of water of crystallization. Traube³ reports that the salt crystallizes in rhombic hemihedral crystals, containing six molecules of water of crystallization. Castoro did not observe at any time the formation of the wart-like crystals. He offers no explanation of the differences and concludes simply that the salt exists with different contents of crystal water. In our investigation we have obtained three sorts of crystals: first, warts which separated from a solution while being concentrated in an open dish on the steam-bath; second, rhombic plates, which deposited from a solution concentrated *in vacuo* at the ordinary temperature; third, compact crystals, belonging to the regular system, which separated while boiling down the filtrate from the second kind of crystals. The first and second sorts of crystals contain four molecules of water of crystallization, while the third sort contains one molecule. It appears to be a question of temperature, as we had anticipated. The solubilities of strontium malate at 13.5° and 100° were also determined.

Malic Acid.—We did some work with malic acid which we obtained from the maple sugar residues called "nitre" by the farmers of Vermont. The amount of malic acid which this will yield varies with the source. A lot with which one of us worked in the Harvard Chemical Laboratory yielded 8.6 per cent. of pure malic acid. A lot which we obtained from the vicinity of St. Johnsbury, Vt., gave less than 5 per cent. The Vermont Experiment Station has found a wide range in the yield. Castoro employed malic acid from rhubarb. The results given below were

¹ *Ann. Chem.* (Liebig), 38, 257.

² *Landw. Vers. Stat.*, 56, 426.

³ *Z. Kr.*, 31, 160.

obtained with some chemically pure malic acid purchased in the market.

Strontium Malate, $\text{Sr}(\text{C}_4\text{H}_5\text{O}_5)_2 \cdot 4\text{H}_2\text{O}$. *Wart-like Crystals*.—Ten grams of malic acid were dissolved in half a liter of water and to the hot solution 25 grams of strontium hydroxide dissolved in half a liter of water were added. The excess of strontium hydroxide was precipitated by carbon dioxide and filtered off. On boiling down the filtrate some strontium carbonate separated and was filtered off. On further concentration wart-like crystals began to appear and on standing over night a large deposit was obtained. These crystals were recrystallized and then again dissolved in 800 cc. of hot water, and concentrated on the steam-bath with mechanical stirring until a good deposit of the wart-like crystals was obtained. They were filtered off by suction on a steam funnel, immediately removed and dried with filter-paper. After being brought to constant weight in the air, they were heated by gradual steps to 190° . A slight browning was noted if the temperature approached 200° . The analysis gave 24.52 and 24.55 per cent. H_2O ; calculated for $\text{SrC}_4\text{H}_4\text{O}_5 \cdot 4\text{H}_2\text{O}$, 24.72 per cent.

Strontium Malate, $\text{SrC}_4\text{H}_4\text{O}_5 \cdot 4\text{H}_2\text{O}$. *Rhombic Plates*.—A solution of the salt, from which no crystals separated at 15° , was concentrated in a vacuum desiccator in a cool place. A crop of very light weight crystals consisting of rhombic plates was obtained. The water of crystallization was completely lost at 190° . The analysis gave 24.83 and 24.81 per cent. H_2O ; calculated, 24.72 per cent.

The anhydrous salt gave 39.94 per cent. Sr; calculated, 39.89 per cent.

Strontium Malate, $\text{SrC}_4\text{H}_4\text{O}_5 \cdot \text{H}_2\text{O}$.—This salt was obtained by working at a higher temperature than that of an exposed solution on a steam-bath. The filtrate from the crystals obtained by concentration *in vacuo* was boiled down over a free flame in a lipped beaker covered with a watch-crystal. Small, compact and brilliant crystals, belonging to the regular system, separated out and adhered strongly to the walls of the beaker. After drying to constant weight in the air, they were heated in an air-bath to 125° , when a slight browning took place, although the crystals did not lose their brilliancy. No appreciable loss in weight had occurred at this temperature and further heating was

discontinued on account of the browning. Determination of strontium gave 37.16 and 37.16 per cent. Sr; calculated, 36.87 per cent.

Solubility Determinations.—In determining the solubility at 100° the method of Pawlewski¹ was employed. The same method of transferring was used in the determination at 13.5°.

For the determination in cold water the solution from which the rhombic plates were obtained was used before the crystals were removed. The determination was made at 13.5°.

	I.	II.
Weight of solution.....	9.2682	9.3738
Weight of SrSO ₄	0.0277	0.0280
Strontium malate in solution.....	0.0331	0.0334
Parts per hundred.....	0.357	0.357

For the determination at 100° the mother-liquor from which the cubical crystals separated was used. As the temperature of this solution was above 100°, more crystals separated out in the determination. The following results were obtained:

	I.	II.
Weight of solution.....	7.1576	7.5326
Weight of SrSO ₄	0.0717	0.0720
Strontium malate in solution.....	0.0857	0.0860
Parts per hundred.....	1.19	1.14

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Magnesium Amalgam as a Reducing Agent.—In an article published in the September number of this Journal entitled "Magnesium Amalgam as a Reducing Agent," by Evans and Fetch, the statement was made: "While magnesium amalgam has been known for some time, having been prepared by Wanklyn and Chapman in 1866, its use as a reducing agent in organic chemistry has hitherto been neglected." This statement was true when the article in question was read before the Cincinnati Section of the American Chemical Society in October, 1901, but was not true when the article was published.

L. Meunier published an article on the use of magnesium amalgam as a reducing agent, entitled "Some Reactions Obtained by the Aid of Magnesium Amalgam," *Comptes Rendus de l'Académie des Sciences de Paris*, 134, 24 (February, 1902), and another, "The Use of Magnesium Amalgam in Organic Chemistry," *Comptes Rendus de l'Académie des Sciences de Paris*, 137, 714 (November,

¹ *Ber. d. chem. Ges.*, 32, 1040.