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NOTES

ON SOME OF THE

CHEMICAL REACTIONS OF MORPHIA.

BY T. G. WORMLEY, M.D.

Pure morphia was dissolved in water by the aid of just sufficient sulphuric acid, and a small drop of a saturated solution of the reagent was applied to a grain of the morphia solution, placed on a glass slide. The amount of morphia operated upon will frequently be stated in the form of a fraction, it being understood to imply the fractional part of a grain of morphia, in one grain of water.

1. Nitric Acid.

1. $\frac{1}{100}$th, grain of morphia in one grain of water, when acted upon by *one drop* of concentrated nitric acid, almost immediately assumes a lemon color, which in a few seconds changes to orange, and finally into a fine red-orange, which very slowly becomes yellow.

2. $\frac{1}{250}$th, the mixture is very soon of a lemon color, changing to a good red-orange.

3. $\frac{1}{300}$th, soon lemon color, which in a few minutes changes to light and then to deep orange.

4. $\frac{1}{1000}$th, very slowly assumes a lemon color, after some minutes a very light orange.

5. $\frac{1}{2500}$th, only a perceptible lemon color after some minutes, very faint and only to be seen upon a white ground.

The test is much more delicate and satisfactory when the morphia solution is evaporated to dryness and then a very small quantity of nitric acid applied to the residue.

1. $\frac{1}{100}$th, when touched by a small drop of nitric acid, the deposit immediately becomes fine red-orange, which slowly dissolves, giving a solution of the same color.

2. $\frac{1}{1000}$th, the deposit is at first yellow, soon changing to a bright brown-orange, giving a solution of fine orange.

3. $\frac{1}{3000}$th, the acid gives a very evident brown color to the residue, which when dissolved gives a solution of a very faint color.

4. $\frac{1}{10000}$th, by using the smallest possible quantity of acid, after a little time the deposit becomes a very distinct faint brown color.

5. $\frac{1}{15000}$th, the action of the acid is perceptible, but not satisfactory.

2. Sesquichloride of Iron.

1. $\frac{1}{100}$th, grain of morphia, with a neutral solution of the sesquichloride of iron gives an immediate faint ink blue cloudiness, which soon forms a good flocculent precipitate.

2. $\frac{1}{250}$th, after a little time the reaction is perceptible, and in a few minutes quite obvious.

3. $\frac{1}{500}$th, after a few minutes the reaction is faint but evident.

4. $\frac{1}{1000}$th, no indication after several minutes.

3. Iodic Acid.

1. $\frac{1}{100}$th, if a drop of the morphia solution be added to a drop of a solution of iodic acid to which there has been added a small drop of starch solution, there will be immediately produced a blue precipitate, with a brown solution.

2. $\frac{1}{500}$th, a quite perceptible blue precipitate, with brown solution.

3. $\frac{1}{1000}$th, there is no precipitate, but the mixture assumes a slight brown tint.

4. Potash.

1. $\frac{1}{100}$th, if touched by a small drop of potash solution, it will give an almost immediate white crystalline precipitate, which is much increased by rubbing the mixture with a glass rod. The precipitate is very soluble in excess of potash.

2. $\frac{1}{500}$th, by rubbing, in a very little time there is produced a very good precipitate.

3. $\frac{1}{1000}$th, in a few minutes the results are satisfactory, especially with the microscope; the precipitate is in the form of granules.

In applying this test it is important that too much of the reagent should not be used, otherwise no precipitate will be produced.

The carbonate of potash gives the same indications as those above.

5. Ammonia.

1. $\frac{1}{100}$th, if the morphia solution be touched by a very small drop of aqua ammonia, or still better, by suspending a drop of the ammonia over the morphia solution for a few moments, the latter solution does not become cloudy, but in a few seconds small crystals are produced which soon become large and abundant. If, after the application of the reagent, the mixture be rubbed, it will give almost immediately a fine crystalline deposit.

2. $\frac{1}{500}$th, in a few seconds crystals appear, and soon are rather abundant. By rubbing they are much increased.

3. $\frac{1}{1000}$th, by rubbing one or two minutes, there is a very good precipitate, consisting of small prisms and granules.

Carbonate of ammonia behaves the same as ammonia.

The above reactions of potash and ammonia would seem to indicate that morphia was not entirely soluble in 1000 parts of water.

6. Iodide of Potassium.

1. $\frac{1}{100}$th, by rubbing, immediately rings of granules and prismatic crystals, which in a little time become almost a mass.

2. $\frac{1}{100}$th, very soon granules and crystals.

3. $\frac{1}{1000}$th, after a little time quite satisfactory.

With the acetate of morphia the reagent acts more slowly, and the results are not as satisfactory.

7. Chromate of Potash.

1. $\frac{1}{100}$th, without rubbing, the reagent gives no precipitate in several minutes, but if stirred, immediately rings and fine crystalline prisms, which soon become abundant. The acetate of morphia, when treated as above, gives no indication for some minutes, then crystals begin to form along the edge of the drops, and after a little time the results are satisfactory, but not nearly so good as in the sulphate.

2. $\frac{1}{500}$th, after rubbing about one minute, small granules appear; after several minutes no distinct crystals.

3. $\frac{1}{1000}$th, by rubbing several minutes, granules, not abundant.

8. Bichromate of Potash.

1. $\frac{1}{1000}$th, very soon a yellow amorphous precipitate begins to form, which in a few minutes is quite good, but remains amorphous. The precipitate slowly dissolves in several drops of acetic acid.

2. $\frac{1}{2500}$th, the precipitate appears after several minutes.

9. Tannic Acid.

1. $\frac{1}{1000}$th, immediately a bluish white cloudiness, which soon forms good dirty white flakes. The precipitate readily dissolves in a few drops of acetic acid and in solution of potash.

2. $\frac{1}{5000}$th, soon quite a good bluish white precipitate.

3. $\frac{1}{10000}$th, after a little time the precipitate is quite perceptible.

10. Carbazotic Acid.

1. $\frac{1}{1000}$th, an immediate copious bright yellow amorphous precipitate, slowly soluble in a few drops of acetic acid.

2. $\frac{1}{3000}$th, very soon quite obvious.

3. $\frac{1}{10000}$th, no indication.

11. Chlorine.

1. $\frac{1}{1000}$th, if 10 grains of the morphia solution be taken and a stream of chlorine be passed into it, the mixture becomes a deep yellow, which upon the addition of ammonia is changed to deep brown, not affected by excess of ammonia or acetic acid.

2. $\frac{1}{10000}$th, 10 grains of, with chlorine gives a yellow tinge, with ammonia, brown.

3. $\frac{1}{3000}$th, 10 grains of, no indication with either the chlorine or ammonia.

12. Bichloride of Platinum.

1. $\frac{1}{1000}$th, an immediate rather copious yellow amorphous precipitate.

2. $\frac{1}{2500}$th, no indication.

13. Bromine in Bromohydric Acid.

1. $\frac{1}{1000}$th, an immediate copious yellow amorphous precipitate, which soon dissolves if there is not excess of reagent.

2. $\frac{1}{10000}$th, an immediate green yellow precipitate.

3. $\frac{1}{25000}$th, a quite distinct but not copious precipitate.

4. $\frac{1}{30000}$th, no indication.

14. Iodine in Iodide of Potassium.

1. $\frac{1}{1000}$th, a copious red brown amorphous precipitate, which slowly dissolves in a few drops of acetic acid, but readily without the

production of a white precipitate, in a solution of potash, this reaction distinguishes morphia from strychnia. If a very small quantity of reagent be applied there will be no precipitate, or it will soon dissolve.

2. $\frac{1}{1000}$th, a very fine red-brown precipitate.

3. $\frac{1}{10000}$th, an immediate cloudiness, which soon becomes a fine brown yellow precipitate.

4. $\frac{1}{20000}$th, a green yellow precipitate.

5. $\frac{1}{30000}$th, after a little time the precipitate is very perceptible.

6. $\frac{1}{80000}$th, after a time the precipitate is perceptible. The best indications are obtained from dilute solutions, by placing a drop of the reagent by the side of the morphia solution, and allowing them to flow together.

15. Terchloride of Gold.

1. $\frac{1}{100}$th, immediate copious yellow amorphous precipitate, which immediately begins to darken; the addition of a drop of potash gives a dark purple precipitate with a deep purple solution. A full drop of reagent should be used, otherwise the precipitate will dissolve.

2. $\frac{1}{1000}$th, in a few seconds, a copious greenish yellow precipitate, which soon begins to darken; upon adding a drop of potash the precipitate nearly all dissolves, and the solution slowly darkens, as does also the precipitate.

3. $\frac{1}{2500}$th, very soon a fine yellowish precipitate, which with a drop of potash entirely dissolves, giving a slight yellow solution.

4. $\frac{1}{3000}$th, much the same as 3.

5. $\frac{1}{10000}$th, in a few seconds the precipitate is very good.

6. $\frac{1}{20000}$th, in a very little time quite good.

7. $\frac{1}{40000}$th, in a few minutes quite satisfactory.

If a very small quantity of the reagent be applied to a strong solution of morphia, there will be no precipitate, or, if produced, it will dissolve upon agitation. This I presume, explains the statement of Taylor,* that morphia gives no precipitate with chloride of gold; and, also, that of Pereira,† who states that the precipitate produced, "on shaking is taken up."

If the precipitate produced from about 20 drops of a $\frac{1}{1000}$th, or stronger solution, be heated, the peecipitate does not dissolve, but becomes brown or dark from a reduction of the gold salt; if a $\frac{1}{2500}$th solution be used, the precipitate dissolves upon heating, but

*On Poisons, Amer. Edit. p. 624, 1848.

† Mat. Med., Amer. Edit. vol. ii. p. 1061, 1854.

immediately upon cooling, the mixture darkens from the presence of small flakes, which after a little time adhere to the sides of the tube; in a $\frac{1}{5000}$th solution, the precipitate readily dissolves upon the application of heat, giving a yellow solution, which undergoes but little change after standing several hours.

With all the above reagents the acetate of morphia gives the same results, except when otherwise stated.

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