V.—*Laboratory Memoranda.*

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I. *The Action of Ferricyanide of Potassium upon Ferric Salts.*—Most works on chemistry describe this reaction as producing a “dark-brown,” or “reddish-brown” fluid, and state that no precipitate is formed;* some Manuals, however, tell us that a “greenish,” or even a “dark-green” liquid is the result.† These statements are all incomplete, and may possibly mislead.

First, as to the colour. The dark-brown liquid is produced only when the ferricyanide of potassium is in *excess* of the ferric salt; the tint in this case is a dark sherry-brown. When the proportions are reversed, and a drop or two only of the ferricyanide mixed with an excess of ferric chloride, a brilliant emerald-green tint of a slightly bluish tinge is the result. If the proportion of ferricyanide of potassium is then gradually increased, the colour is first changed to sap-green, then olive-brown, and at last reaches the dark sherry tint before described. The whole series of colours is well seen if a single drop of ferricyanide of potassium is allowed to run down the side of a test-tube half filled with dilute ferric chloride; a brown ring forms at the surface, where the ferricyanide is in excess, from which streaks of colour slowly descend, their tint changing from brown to bright green, as they fall further towards the bottom.

It appears, then, that the colour produced on mixing an alkaline ferricyanide and a ferric salt is essentially dependent on the proportion of each which may be present.

Lastly, as to the statement that the liquid remains *clear*. This is true only when the solution is sufficiently acid; *basic* ferric salts afford an immediate pale brown precipitate with ferricyanide of potassium.

These results were all obtained with a freshly prepared solution of the ferricyanide.

II. *The Solubility of Magnesia in Alkaline Salts.*—That magnesia dissolves in salts of ammonium, with evolution of free ammonia, is a sufficiently familiar fact. That the presence of ammonium-salts hinders or entirely prevents the precipitation of hydrated magnesia by an alkali, is equally well known; but it is not, per-

* So Rose, Fresenius, and Gmelin.

† Thus Miller, and Northcote and Church.

haps, so generally understood, that salts of potassium and sodium have an exactly similar effect, though in a far smaller degree. The action of ammonium-salts, in preventing the precipitation of magnesia, is usually explained as owing to the formation of double salts of magnesium and ammonium. If this theory be correct, then the presence of *any* soluble base forming double compounds with magnesium, ought to have a similar effect, and consequently we should expect that salts of potassium and sodium would in this particular behave like salts of ammonium.

Magnesia dissolves to a small extent in a strong solution of a salt of potassium, and also in salts of sodium, the alkaline salt being in this case evidently decomposed, as the liquid strongly reddens turmeric paper.

The following experiments were made as to the faculty of alkaline salts to prevent the precipitation of hydrated magnesia. Two equal volumes of a solution of chloride of magnesium were taken; in one of these 200 grs. of chloride of potassium were dissolved; both were then treated with equal volumes of a solution of caustic potash; and, after standing some hours in a warm place, filtered, and the magnesium in the filtrate (that, therefore, which the potash had *failed* to precipitate) estimated by phosphate of sodium in the usual way. The experiment with chloride of potassium yielded 1.54 grs. of $Mg_4P_2O_7$, the other only 1.39 grs.; the potassium-salt had clearly then to a slight extent prevented the precipitation of magnesia. An experiment with chloride of sodium yielded a similar result. Trial was also made with sulphate of magnesium, the sulphates of potassium and sodium being added. The amounts of magnesium unprecipitated by the potash are shewn by the following weights of pyrophosphate obtained:—

With sulphate of magnesium alone		15 grs.
„	„ and sulphate of potassium	50 „
„	„ and sulphate of sodium	56 „

Another experiment, in which caustic soda was the precipitant, gave similar results.

With sulphate of magnesium alone		94 grs.
„	„ and sulphate of potassium	1.15 „
„	„ and sulphate of sodium	1.35 „

When these experiments were repeated with an increased quantity of caustic potash or soda, the effect here noted practically

disappeared, a trace only of magnesium being found in any filtrate; this indeed took place when the amount of potash was increased by one-half, or even less. The excess of potash doubtless decomposed the double salt first formed, in the same way that a large excess of ammonia precipitates hydrated magnesia, even in the presence of sal-ammoniac.

It appears then that salts of potassium and sodium do really hinder the precipitation of hydrate of magnesium,* though to not nearly the same extent as salts of ammonium; a result which well accords with theory, as the double compounds of magnesium with the former salts are well known to be far less stable than those with the latter.

Another fact in connection with the solubility of magnesia in alkaline salts, is the decomposition of this solution by water under certain conditions. For instance, if a strong solution of magnesium be mixed with sal-ammoniac and free ammonia, the proportion of the two latter being so adjusted as *just* to prevent precipitation on standing, the equilibrium of the mixture thus formed is destroyed by the addition of water, and magnesia is precipitated. In one experiment a mixed solution of the chlorides of magnesium and ammonium was treated with twice its volume of the strongest ammonia; at the end of twelve hours, the solution was still perfectly clear. An exactly similar mixture was prepared, and diluted with water to three times its bulk; at the end of twelve hours a considerable precipitate of magnesia had fallen. Salts of ammonium appear then to hinder the precipitation of magnesia in proportion to their concentration.

This fact serves to explain a phenomenon sometimes observed when making determinations of phosphoric acid. If the washings of the phosphate of magnesium and ammonium are allowed to mix with the main filtrate, an opaque ring is often formed at the junction of the two liquids, alarming the operator with the idea that his precipitate is washing through; the washings, however, if collected separately, are found to be perfectly clear. The cause of this appearance is probably the precipitation of the excess of magnesia on diffusion into the wash-water.

* According to Longchamp (Ann. Chim. Phys., [3], xii. 255.) the precipitation of *carbonate of magnesium* is less complete in proportion to the amount of alkaline salts present.