tin are closely related. Salts and acids compete with gelatin for the water present but they also peptize gelatin. It must be that both degree of hydration and size of peptized particles are important only insofar as they secure favorable viscosity.

Summary.

When kerosene was emulsified in water by the aid of gelatin it was found that:

1. The maximum lowering of surface tension should be secured. This is obtained just as well by 0.3 g. or 0.4 g. of gelatin per 100 cc. of water as by 1.0 g. Acids, bases and liquefying salts also lower it a little while solidifying salts raise it.
2. Viscosity must not be increased more than a little beyond that of water. This means either (1) that only a small amount of gelatin can be used or (2) that the gelatin must be liquefied by the proper electrolytes. The latter method yields the better emulsion.
3. An excess of acid, base or liquefying salt should not be used. This probably means that the structure of the gelatin must not be entirely destroyed or that it must not be reduced to near molecular sizes.
4. There is no convincing evidence that gelatin particles are withdrawn from the solution to form adhesion layers about the oil droplets.
5. There is no evidence that as the oil content is increased the gelatin content must also be increased in order to produce as good an emulsion. This would surely be the case were adhesion layers formed around the oil droplets. One gelatin content in a given volume of water can be selected that will make the best emulsion for all oil contents.
6. The leading factor in oil-water emulsification with the aid of gelatin is viscosity, not the maximum but the most favorable viscosity. These conclusions refer only to gelatin, but investigation may show that they apply to all highly hydrated compounds.

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NOTE.

The Separation of Iron from Aluminum by Precipitation as Prussian Blue.—In Dr. Ddgar F. Smith's "Chemistry in Old Philadelphia," it was suggested[1] that a study should be made of the possibility of a quantitative separation of iron from aluminum by precipitation as prussian blue. The work of Robinson[2] showed that double and triple ferrocyanides of magnesium, aluminum and cerium are formed when solutions of the chlorides of these metals are mixed with potassium ferrocyanide. He tried only 0.5, 0.25 and 0.125 *N* solutions.

[1] P. 47.

[2] Robinson, *J. Chem. Soc.*, **95**, 1356 (1909).

Acting on this suggestion, we have repeated Robinson's experiments and have attempted to prevent the formation of the jelly usually obtained. Solutions were tried ranging in concentration from 0.25 to 0.025 *N*. Hydrochloric acid was added in concentrations ranging from *N* to 0.01 *N*. It was found that the acid retarded the formation of the jelly increasingly as the concentration was increased. However, there is no permanent preventative effect; the jelly only required a longer time for settling.

After the addition of an equimolecular amount of potassium ferrocyanide to acid solutions of aluminum chloride of 0.5, 0.05, and 0.025 *M* concentration, aluminum hydroxide was precipitated with ammonium hydroxide; but instead of the usual flocculent precipitate, the mass set to a jelly. Boiling had no noticeable effect.

The composition of the jelly from aqueous solutions is represented by the formula $KAlFe(CN)_6.6H_2O$; that of the jelly from ammoniacal solutions, by $NH_4AlFe(CN)_6.6H_2O$.[1]

The precipitation of prussian blue from a ferric solution took place immediately in the presence of only a little free hydrochloric acid, but a larger amount greatly retarded, or even prevented, the formation of the precipitate. This is in accordance with the results obtained by Vordlander.[2]

Means of coagulating and filtering the prussian blue thus obtained were then tried. The work of Pappada[3] and that of Ishizaka[4] show that according to the theory of Freundlich, the coagulating effect of the electrolytes depends upon the atomic weights and the valences of the active ions. In order to study this a precipitate of prussian blue was prepared by adding an excess of ferric chloride to an aqueous solution of potassium ferrocyanide; this was considered the best method of obtaining true insoluble prussian blue of the composition $Fe_4Fe(CN)_6.\ 9H_2O$.[5] This prussian blue was a negative colloid in aqueous solution. Solutions of the following salts were added as coagulators: sodium chloride, barium chloride, aluminum chloride, potassium sulfate, and potassium acetate. With very concentrated solutions of these substances perfect coagulation took place and the precipitates settled rapidly. With very dilute solutions, however, a distinct difference in the times of coagulation was detected. The best results were obtained with aluminum chloride. However, free hydrochloric acid greatly retarded coagulation and prevented it from being complete. After coagulation it was found that quantitative filtration was impossible, although centrifuging gave good results.

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[1] Robinson, *loc. cit.*

[2] Vordlander, *Ber.*, 46, 181 (1913); *C. A.*, 7, 1337 (1913); 13, 1274 (1919).

[3] Pappada, *Z. Chem. Ind. Koll.*, 6, 83 (1910); *C. A.*, 4, 1706 (1910).

[4] Ishizaka, *Z. physik. Chem.*, 83, 97 (1913); *C. A.*, 7, 2878 (1913).

[5] Roscoe and Schorlemmer, "A Treatise on Chemistry," 4th ed, 2, 1235–8.

Conclusions.

The quantitative separation of iron from aluminum as prussian blue cannot be effected because the aluminum interacts with the excess ferrocyanide, forming a jelly which cannot be handled.

The precipitate of prussian blue cannot be successfully filtered even after apparently perfect coagulation.

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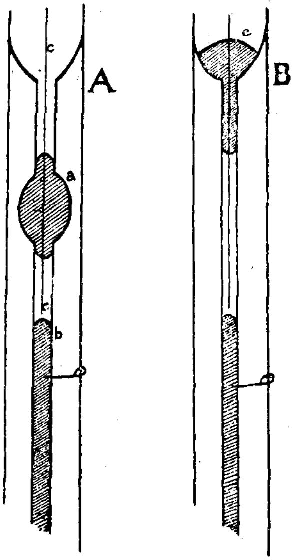
A Thermo-regulator.—The purest mercury, when used for thermoregulators, becomes dirty in the capillary tube due to oxidation by the small arc formed when the contact is broken between the mercury column and the adjustable wire contact. Devices are used for passing a stream of inert or reducing gas over the top of the mercury so that the arc will be formed in the presence of the gas. This method of oxide prevention requires a side tube on the regulator and an apparatus for generating a continuous flow of gas. I have found a much simpler device to be quite as effective and one which can be used on old regulators. New regulators can be better fitted by a slight modification in design.



In the drawing A shows the capillary of a regulator with a small bulb blown at *a*. The wire *c c* makes a contact at *b*. A small capillary pipet is slipped down to *b* and a stream of some inert gas is passed in to displace the air in the capillary. Then the capillary is sealed with a few drops of mercury in *a*. This mercury rises and falls with the rise and fall of *b* but never slips down to connect with *b*. Any arc formed between the wire and the mercury column at *b* is in the presence of the inert gas.

In the capillary of an ordinary regulator, B, a drop of mercury at *e* seals the capillary. I have also found it perfectly satisfactory to insert a drop of mercury in the capillary tube without first displacing the air. In this case, the oxygen soon combines with the mercury, forming a small amount of oxide. Then the regulator can be permanently set and the arc is formed in an atmosphere of the nitrogen which remains.

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