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CURRENT NOTES ON CHEMISTRY.—IV.

(*Edited by Charles Platt, Ph.D., F. C. S.*)

Advance in the Analytical Chemistry of Recent Years.

Prof. Albert B. Prescott has outlined some of the most distinctive advances of analytical chemistry in a paper read before the World's Congress of Chemists. First we have "the resolute attempt to find out the composition of matter, as a whole, in any and all of its mixtures of whatever source." Complete analysis, proximate and ultimate, of complex substances has been entered upon, and "undetermined residues" have been made the beginning instead of the end of chemical research. The courage of analytical effort in recent years has been seen especially in the elaboration of methods for the isolation of carbon compounds, both natural and artificial. Proximate organic analysis has been called for by many practical workers, and we are now enriched by the labors of thousands in this field, which was opened largely by Dragendorff and Hoppe-Seyler. We have an increased knowledge of the molecular structure of bodies produced by nature—mineral, vegetable, and animal, as well as those of artificial production. Important advance has also been made in the employment of physical methods of inspection whereby molecular change is avoided. We have but to mention in this connection the multiplication of optical methods, the polarimeter, the refractometer, the spectroscope, recent studies in molecular mass, the freezing and melting points, solutions, adhesion and capillarity.

An exhibition of advance made is furthermore found in the reciprocal benefits of scientific research and of technical skill as seen in the work of experts in biological and pathological analysis, sanitary and forensic analysis, in the industries, and in agriculture and metallurgy.

Sodium Peroxide in Analysis.

Probably no other recent addition to the reagents of the laboratory has become of such importance as has the peroxide of sodium, $Na_2 O_2$. Its superiority as an oxidizing agent is firmly established, both because of its purity and because of its rapidity of action; and while but a few years ago it was something of a curiosity, it is now an article of commerce used in industrial operations, as well as in the finer applications of the laboratory. So long ago as 1871 Dr. John Clark pointed out, through the *Chemical News*, the strong oxidizing power of a mixture of caustic soda and calcined magnesia, and, a little later, illustrated the value of this action in the analysis of sulphides. As Dr. Clark states in a recent paper in the *Journal of the Chemical Society* (London), the exact cause of the above action was not quite clear at the time, but has since been determined by him to be due to the formation of the peroxides of sodium and magnesium. Hempel shows the superiority of the peroxide for the detection of chromium and manganese, and for rendering titaniferous iron ore soluble, but considers that for the oxidation of sulphur compounds that the addition of sodium carbonate is necessary to reduce the violence of the action. Clark, however, in the article referred to, prefers to use the peroxide without admixture with carbonate, stating that when a sufficiently low temperature is employed there is less tendency to loss by spurting and the action is completed in less time. In the analysis of pyrites, the procedure is as follows: One part, by weight, of the pyrites is mixed with six parts, by weight, of sodium peroxide in a platinum or nickel crucible, placed about two inches above a very low Bunsen flame. Oxidation immediately sets in and the mixture becomes red-hot. A few minutes suffices for the action, and upon its completion the sulphur is easily soluble in water. The solution is acidified and the sulphur precipitated as barium sulphate. In the case of blende part of the zinc dissolves with the sulphur, so that when it is desired to determine the zinc also the mixture is acidified with hydrochloric acid and precipitated with sodium carbonate before filtration. Galena, after treatment with peroxide, yields part of its lead into solution, and it is therefore advisable to acidify slightly with nitric acid and to boil with excess of sodium carbonate, when all the lead will be rendered insoluble, and upon filtration the whole of the sulphur will be found in the filtrate. By fusion with peroxide, arsenic is converted into soluble arsenate, and may then be estimated by any of the ordinary methods.

Dr. Clark uses peroxide of sodium most advantageously in the estimation of chromium and in the analysis of chrome ore. The temperature should not be so high as to liquefy the mixture, but just enough to form a paste, under which condition the contents of the crucible shrink, leaving a space between the mixture and the walls of the crucible. The mass is extracted with water and the solution boiled to decompose any excess of peroxide if the chromium is to be titrated. The insoluble residue dissolves easily in hydrochloric acid, and should be tested for any traces of undecomposed ore. The beauty and ease of this process can only be fully realized by analysts who have had practical experience with refractory chromium compounds. The analysis of ferro-chromium is conducted in the same manner, the metal being first reduced to a fine powder and then mixed with six times its weight of peroxide. This reagent is also applicable with some modifications in procedure to the quantitative estimation of chromium in steel, and in the quantitative separation of manganese from zinc, nickel and cobalt, the solution in this latter case being made in cold water, to avoid decomposition, which gradually sets in. In the separation of zinc and manganese, the latter is thrown down perfectly free from the former by the addition of peroxide to the ammoniacal liquid, or, as is recommended in the separation of manganese and cobalt, that the cobalt should be in the highest state of oxidation, the sodium peroxide may be added to the cold acid solution before rendering it alkaline with ammonia. In the separation of manganese from nickel and cobalt it is advisable to redissolve and to repeat the operation. Another valuable application of sodium peroxide is in the breaking down of tungsten minerals for analysis.

In a paper read before the British Association, at the Nottingham meeting, Dr. S. Rideal and Mr. H. J. Bult