Standard Samples

ESTABLISHED forty-seven years ago as an aid to analytical chemistry, the standard sample program of the National Bureau of Standards has grown to include a much broader range of scientific work. Standard samples are now certified by the bureau not only for chemical composition but for such properties as density, melting point, viscosity, acidity, color, gloss, index of refraction, and heat of combustion. New standards are constantly being added to meet the increasing requirements of science and industry. Recent additions include a number of standard samples of artificially produced radioactive isotopes for use in nuclear physics, biochemical research, and allied fields. The bureau is now issuing approximately 25,000 standard samples annually, representing more than 500 kinds of materials.

The NBS standard samples are materials that have been carefully analyzed, or the physical properties of which have been precisely determined, at the bureau and sometimes in other laboratories. About 200 of the 500 standard materials are certified for chemical composition. The majority of these are samples of metals and alloys; they are used extensively to monitor the thousands of analyses made daily in industrial laboratories to control the quality of steel and other commercial products. The standards of chemical composition serve also as a guide to the research analyst engaged in developing new methods of analysis or in determining the composition of unknown materials. Some 70 of the composition standards have been prepared specifically for use in spectrographic analysis.

Smaller in number, but of great value to the chemist, are the standards that are certified with respect to their quantitative behavior in fundamental chemical reactions, especially those between bases and acids, and those involving oxidation and reduction. Standards of pH provide solutions of known and accurately reproducible acidity. Other materials, certified for heat of combustion, govern the innumerable measurements that are made of the heating value of fuels.

Standard samples are used to check and maintain the accuracy of many kinds of measuring instruments, such as polarimeters and refractometers. A number of metals, issued with certified melting points, serve to calibrate temperature-measuring instruments in the metallurgical, ceramic, and other industries.

There are also about 200 samples of hydrocarbons issued as "pure substances" and certified with respect to their degree of purity. This group was developed during the war years and immediately afterward in response to the need for standards to calibrate the instruments used in controlling the production of synthetic rubber and special fuels for military aviation.

Radon, γ-ray, and β-ray standards are used to check radiation-detecting instruments and to further research in radioactivity. Recent developments in this group are radioactive standards of carbon 14, iodine 131, phosphorus 32, and cobalt 60.

The NBS standard sample program began in 1905, when the American Foundrymen's Association turned over to the bureau its four sets of standardized pig-iron samples. As the analysis and distribution of these samples proceeded, the need for additional standards became apparent. However, growth of the program was necessarily gradual, because its usefulness depended in a large degree on the confidence that could be placed in the reliability of each new kind of sample. Attainment of this confidence has required not only many painstaking measurements and analyses but studies of stability over a period of years and research to determine the extent to which uniformity could be established in a group of samples. In this work the bureau has had the cooperation of the leading technical societies of the country. These organizations also perform a valuable service in suggesting future lines of activity in the standard sample program.

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National Bureau of Standards

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