
Overview

The specifications prepared by the Committee on Analytical Reagents of the American Chemical Society are intended to serve for reagents and standard-grade reference materials to be used in precise analytical work of a general nature. Standard-grade reference materials are suitable for preparation of analytical standards used for a variety of applications, including instrument calibration, quality control, analyte identification, method performance, and other applications requiring high-purity materials. (For the sake of brevity, standard-grade reference materials may be referred to as *standards* throughout this book.) It is recognized that there may be special uses for which reagents and standard-grade reference materials conforming to other, or more rigorous, specifications may be needed. Therefore, where known and where feasible, some of the specifications herein include requirements and tests for certain specialized uses. However, it is impossible to include specifications for all such uses, and thus there may be occasions when it will be necessary for the analyst to further purify reagents known to have special purity requirements for certain uses.

The American Chemical Society has adopted the practice of expressing the concentration of chemical solutions in terms of mol/L (moles per liter). However, the concentrations of volumetric solutions used in analytical chemistry usually are expressed as *normality*, N (the number of gram-equivalent weights in each liter of solution), or sometimes as *molarity*, M (the number of gram molecular weights in each liter of solution). In this book, it has been the practice to express such concentrations as either normality or molarity. Two examples showing equivalent concentrations by these two practices are: "...1 N sodium hydroxide (1 mol/L)" and "...1 N sulfuric acid (0.5 mol/L)". However, as can be seen, using mol/L destroys the concept of equivalents, as they are applied in volumetric analysis. Furthermore, it is unwieldy to write a calculation formula where the concentrations of the volumetric solutions are expressed in mol/L. Therefore, the use of normality and molarity are retained in this edition of *Reagent Chemicals*, which makes its practice consistent with that of other chemical testing societies and publications, such as the American Society for Testing and Materials (ASTM), the *United States Pharmacopeia*, and the *Food Chemicals Codex*.

The specifications and the details of tests are based on published work, on the experience of members of the Committee in the examination of reagent chemicals and standards on the market, and on studies of the tests made by members of the Committee. The limits

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and procedures are designed for application to reagents and standards in freshly opened containers. Reagents and standards in containers of extended age, in containers subject to constant changes in humidity or headspace gas content (as by repetitive opening and closing of the container), or in containers subjected to potential contamination by repeated opening of the container may not conform to the designated requirements. Where the possibility of change due to age, humidity, light, or headspace contamination is recognized, the specification usually contains a warning; nonetheless, the analyst is cautioned to take appropriate steps to ensure the continued purity of the reagents and standards, especially after opening the container.

In determining quality levels to be defined by new or revised specifications, the Committee is guided by the following general principles. When a specification is first prepared, it will usually be based on the highest level of purity (of the reagent or standard to which it applies) that is competitively available. Generally, the term “competitively available” is understood to mean that the material is available from two or more suppliers. If a significantly higher level of purity subsequently becomes available on the same competitive basis, the specification generally will be revised accordingly. There may be cases where a material is available from only one producer. This does not preclude it from becoming an ACS reagent or standard, if a suitable specification can be prepared. If the reagent or standard later becomes available on a competitive basis, it will be appropriate to review the specification for possible revision.

Because the requirements of a specification relating to the content of designated impurities must necessarily be expressed in terms of maximum allowable limits, products conforming to the specification will normally contain less than the maximum allowable proportion of some or all of these impurities. A given preparation of a reagent chemical or standard that has less than the maximum content of one or more impurities permitted by the specification, therefore, is not considered as of higher quality than that defined by the specification.

A lower allowable limit for a given impurity will be adopted only if it is significantly different from the one it is intended to supersede. In general, a new specification for an impurity whose content is not greater than 0.01% will not be considered significantly different unless it decreases the maximum permissible content of the impurity by at least 50%. This principle also will be approximated in the revision of those specifications defined by the term “Passes test”.

Tests as written are considered to be applicable only to the accompanying specifications. Modification of a specification, especially if the change is toward a higher level of purity, will necessitate reconsideration, and often revision, of the test to ensure its validity.

The assays and tests described herein constitute the methods upon which the ACS specifications for reagent chemicals and standards are based. The analyst is not prevented, however, from applying alternative methods of analysis. Such methods shall be validated to ensure that they produce results of at least equal reliability. The Committee has developed a policy for validation of analytical methods described in this book, which is presented in the next section, “Classical Methods of Analysis.” In the event of doubt or disagreement concerning a substance purported to comply with the ACS specifications, only the methods described herein are applicable.