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## List of primary standard chemicals

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Standards in chemistry are substances with known concentrations, allowing for precise measurements and determinations. They serve as references to determine unknown concentrations, standardize volumetric solutions, prepare secondary standards, and calibrate instruments. There are two main types of standards: primary and secondary. Primary standards possess exceptional qualities, including being extremely pure (at least 99.98%), highly stable, anhydrous, less hygroscopic, having a very high molecular weight, easy to weigh, ready to use, and non-toxic. These characteristics make them ideal for establishing true values in analytical procedures. They are often manufactured specifically for this purpose and can be used as reference materials in calibration and method validation. Secondary standards, on the other hand, are substances that may be used as alternatives or complements to primary standards. While not possessing the same level of purity and stability as primary standards, they still offer a reliable means of standardization and calibration in specific contexts. A secondary standard is a solution that has been standardized by titration against a primary standard, which is a substance with an exactly known amount of active substance per unit volume. The concentration of the dissolved solute in a secondary standard solution is determined by reaction rather than by weight. This process involves using a high-grade pure solvent, such as water, and ensuring it is deionized to avoid any impurities that could affect the accuracy of the standard. Before preparing a secondary standard solution, it's essential to check the date of manufacture, expiry date, and the seal for tampering to ensure its purity and stability. Additionally, some substances, like sodium hydroxide, are not suitable for use as primary standards due to their tendency to absorb moisture or react with other substances. These substances can still be used as secondary standards if they meet certain criteria, such as having a higher degree of impurity than the primary standard, being less stable and more reactive, but remaining stable for an extended period. The normality or molarity of these solutions can be determined by titrating them against a primary standard solution. For instance, anhydrous sodium hydroxide is highly hygroscopic and will absorb moisture from the atmosphere, making it unsuitable as a primary standard. However, its properties make it suitable for use as a secondary standard in certain applications. Because NaOH crystals absorb water molecules from the air, they should be weighed in a glass container like a Petri dish to avoid reaction with metal balance pans. Another example is potassium permanganate (KMnO<sub>4</sub>), which is often used as a secondary standard due to its reactivity and tendency to form manganese oxide (MnO<sub>2</sub>) contaminants. Although it's not suitable for primary standards, it can still be employed effectively as a secondary standard in smaller laboratories for calibration purposes. Calibration involves comparing measurements with a standard or instrument to eliminate variations. Requirements for primary standards include having a known purity, being easy to obtain and purify, and not reacting with air during weighing. The substance should also be stable and have a high relative molecular mass to minimize weighing errors. Additionally, it should be readily soluble and have a stoichiometric reaction with the standard solution. Examples of primary standards include sodium hydroxide (NaOH) for alkalimetry and anhydrous sodium carbonate for acidimetry, as well as potassium hydrogen phthalate for acid-base titrations. 1. Permanganate : Arsenic Trioxide, Sodium Oxalate, Potassium dichromate 2. Iodometry (Sodium Thiosulphate) : Potassium bromate, Potassium dichromate, Potassium iodate 3. Iodimetry (Iodine) : Arsenic trioxide 4. The base NaOH is an example of a secondary standard. Commercially available NaOH contains impurities and readily absorbs water from the atmosphere. To determine its concentration in solution, it's titrated against a primary standard weak acid. Examples of secondary standards include commercially available chemicals that are not pure enough to be used as primary standards. Keep substances pure and intact for accurate measurements. Some substances, like NaOH, can absorb water from their surroundings, making them tricky to handle. Primary standards have a known formula and don't change when weighed. For instance, nitric acid (HNO<sub>3</sub>) dissolves in water with unknown amounts of nitrous acid (HNO<sub>2</sub>), affecting the reaction's outcome. Physical contact during weighing can alter a substance's mass, purity, and other critical properties. This challenge has puzzled scientists for centuries as they seek measuring systems that don't impact the quantity being measured. By maintaining pure substances, researchers can ensure accurate results in their experiments.