

Gas Mixtures.

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GAS MIXTURES

Analytical Chemists know that the analytical capability of their instrumentation is only as good as the calibration of their equipment. Gas mixtures produced by Air Liquide have long been selected as the definitive standard for calibration procedures. Our ISO 9001-2000 certified laboratories follow strict procedures for preparation and analysis of gas mixtures, thus ensuring products of the highest quality and fully traceable to recognized standards. When appropriate, our calibration mixtures are analyzed against benchmark standards such as Standard Reference Materials (SRMs) obtained from the National Industrial Standards and Technology (NIST) or other recognized suppliers such as NMI in The Netherlands.

Air Liquide also uses standards such as NIST Traceable Reference Materials (NTRMs), or Gas Manufacturers Internal Standards (GMIS). These standards have a well-documented path of traceability to accepted benchmarks common to the gas industry.

HOW GAS MIXTURES ARE PREPARED AND ANALYZED

Gravimetric Mixtures

Gas mixtures are prepared by a number of different methods. By far the most common method used is to gravimetrically weigh in each component of the mixture using accurate scales. These scales are routinely calibrated against NIST weights, meaning that the actual mixture can be considered as being NIST traceable. Oftentimes, these gravimetric numbers are considered to have less uncertainty than analysis against other reference standards. This is particularly true for mixtures containing non-reactive components at percent level concentrations.

Partial Pressure Mixtures

An alternative way to prepare gas mixtures is by partial pressure following Dalton's Law for gas mixtures: the pressure of each component is determined as a percentage of the total pressure of the mixture. Less volatile components are added first followed by gases with higher vapor pressures. Using this method, multiple cylinders can be filled on manifolds. To determine accurate concentrations for mixtures prepared by this method, analysis against reference standards must be done.

HOW AIR LIQUIDE CAN SUPPLY THE QUALITY MIXTURES YOU REQUIRE

One critical factor is important for the preparation of gas mixtures by either method above. It is imperative that each pure component used to make a gas blend be of the highest purity available. If cheaper raw materials of lower purity are used, gravimetric numbers should not be used to determine the concentration of that component unless the uncertainty of the purity is factored into the reported numbers. Also, the use of lower purity raw materials can create problems for the end user, such as unidentified peaks on chromatographs. Air Liquide only uses the highest purity components available to make our mixtures. Currently, we stock more than 800 pure components at our labs for use in making gas or liquid standards.

Limitations

Because of the infinite number of combinations of gases which can be produced, the Gas Mixture Section serves as a general guideline for many of the commonly requested mixtures. While our laboratories exercise great flexibility in preparing the exact mixture you require, there may be some limitations on certain mixtures due to the following factors:

- **Mixtures that cannot be prepared due to safety factors**
- **Mixtures containing components that can react with other components**
- **Mixtures that do not remain homogeneous or stable in the cylinder**
- **Mixtures outside the prescribed limits of preparation tolerance or analytical accuracy outlined in the table on the following page**
- **Certain mixtures with components at ppm or ppb levels whose balance gas contains higher levels of these components prior to blending**

Please contact us for assistance in determining how to prepare the gas mixture you require.



Our clients use sophisticated instruments to certify the consumption of the calibration standards we prepare.