

Glossary of Specialty Gas Terminology

Å Angstrom, a unit of measure equal to 1×10^{-10} meters in length.

AA Abbreviation commonly used for atomic absorption spectroscopy.

ACGIH American Conference of Governmental Industrial Hygienists, a group which makes recommendations on the exposure levels of hazardous materials in the workplace.

ASTM American Society of Testing Materials, an organization which sponsors committees which develop standards for Industrial Manufacturers and Consumers.

Absolute Pressure A measurement of pressure which sets a total vacuum as having a value of zero. For example the commonly used term psia stands for pounds per square inch of absolute pressure.

Absolute Zero The lowest point in the Kelvin temperature scale. $0^{\circ}\text{K} = -459.67^{\circ}\text{F}$ or -273.15°C in the Fahrenheit or Celsius temperature scales, respectively.

Absorption The physical penetration of a substance into the structure of another substance, such as the dissolution of a gas into a liquid.

Accuracy Expresses the degree of agreement of a measured value when compared to the true or expected value of the quantity of concern. This term is often confused with precision, which is the range of the confidence level within which a measured value can be considered valid.

Adsorption The adherence of molecules, ions or atoms of a gas or liquid to the surface of another substance. The adsorbed species is thought to be adhered to the surface by weak physical or chemical forces.

Aerobic Describes gases that contain oxygen and which are commonly used as atmospheres for biological culture growth.

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Anaerobic Describes gases that do not contain oxygen which are used for biological culture growth.

Anhydrous Literally means *without water*. The term is often used with those gases that are particularly corrosive in the presence of moisture, such as ammonia.

Annealing Gas A gas blend used as a reducing atmosphere in the metals industry during heating to render them less brittle. A commonly used furnace gas consists of a blend of hydrogen and nitrogen.

Asphyxiant Gas A gas which displaces air in an enclosed space and which can cause unconsciousness or death due to lack of oxygen.

Avogadro's Law One of the gas laws which states that equal volumes of gases at the same temperature and pressure contain the same number of molecules.

Avogadro's Number The number of molecules in one mole or gram-molecular weight of a substance (6.0221367×10^{23} molecules/gm-mole).

Azeotrope A mixture of two substances that typically cannot be separated easily by simple distillation. A commonly used term to describe a liquid mixture that has a constant boiling point.

BTU An abbreviation for British Thermal Unit, a unit of energy defined as the quantity of heat needed

to raise the temperature of one pound of water 1°F.

Boiling Point (BP) The temperature of a liquid at which the vapor pressure is equal to the pressure of the atmosphere above it.

Bourdon Tube A curved metal tube commonly used in pressure gauges. The tube flexes a known degree as pressure is applied, and that movement is translated as the physical movement of a gauge needle across a scale.

Boyle's Law A gas law which states that for an Ideal Gas at constant temperature the volume of the gas is inversely proportional to the pressure applied.

Burst Pressure The designed test pressure at which a gas-containment device such as a cylinder, piping or pressure adjusting device will begin leaking but not violently rupture. For most gas handling equipment, the industrial standard is that the burst pressure is four times (400%) of the normal operating pressure.

Calibration Gas Standard A gas mixture that has been accurately analyzed against a known reference standard. This mixture can be used as a comparative standard for determinations on analytical instruments.

Calorie The amount of heat required to raise the temperature of one gram of water at 15°C by one degree Celsius.

Carrier Gas The gas which flows through a separation column of a gas chromatograph and propels a sample to a detector.

Catalyst A substance which initiates or accelerates a chemical reaction.

CAS Number A Chemical Abstract Services numbering system assigned to each new chemical as it is reported in the world's literature. Virtually every commercially manufactured chemical has been assigned a CAS number which allows it to be easily identified.

Celsius A temperature scale that has been set up so that ice melts at 0° and water boils at 100°C.

Certificate of Analysis (COA) A printed guarantee by a gas producer that a particular gas has been analyzed to the levels of purity or impurity stated.

Certificate of Conformance (COC) A printed guarantee by a gas producer that a particular gas meets a recognized standard.

Chemiluminescence Absorption and emission of light by a chemical compound. Chemiluminescence detectors function by monitoring this absorption and emission of light by a substance at certain wavelengths.

Chromatography An analytical method where a mixture is physically separated into its individual components.

Coefficient of Flow (CV) Rate of flow through a regulator or other gas handling device measured in U.S. gallons per minute at 60°F with a pressure differential of 1 psig.

Compressed Gas A gas in a container which meets one of the following criteria:

- Contained at pressures exceeding 40 psia at 70°F
- Contained at pressures exceeding 104 psia at 130°F
- A flammable liquid having a vapor pressure exceeding 40 psia at 100°F as determined by ASTM D-323-72

Compressed Gas Association (CGA) A nonprofit technical organization which develops and

promotes industry standards for the safe handling, transport and storage of compressed gases.

Corrosive The ability of a chemical to attack another substance, causing irreversible damage. The term applies to substances which attack human tissue and other materials it may come in contact.

Cracking Pressure The inlet pressure at which a gas begins to flow through a regulator, valve or other pressure-control device.

Creep The slow increase in the outlet pressure of a regulator which may be caused by changes in inlet pressure or failure of the regulator seat.

Critical Density The density of a pure substance at its critical point.

Critical Point The point of a temperature vs. pressure curve of a pure substance above which a gas cannot exist in both gas and liquid phases.

Critical Pressure The pressure at the critical point above which a pure gas cannot be liquefied.

Critical Temperature The temperature above which a gas cannot be liquefied by pressure alone.

Cryogenic Liquid A liquid having a normal boiling point below -240°F. (-151.1°C).

Cryogenic Vessel An insulated container for the storage, transport and dispensing of liquids having a boiling point below -130°F.

Cylinder A container designed to safely hold compressed gases and which is designed and tested to meet government specified standards of construction.

Dalton's Law of Partial Pressure One of the gas laws which states that for ideal gases the pressure of a gas blend is equal to the sum of the pressures of each of its components.

Density The mass of a substance divided by its volume.

Department of Transportation (DOT) Federal agency that regulates the transport of hazardous materials per Title 49, Code of Federal Regulations.

Dewar A vessel that is usually portable and is used to contain cryogenic liquids.

Dew Point The temperature at which a gas vapor begins to condense as a liquid.

Diameter Index Safety System (DISS) Type of valve designed with metal to metal seals for high leak integrity, generally used for high purity, corrosive or toxic gases.

Discharge Ionization Detector (DID) A universal detector used in gas chromatography where the species detected is ionized by electrical discharges between plates.

Dopant An impurity added to a pure substance in small amounts to alter its properties.

DOT Numbers Product identification numbers assigned to chemicals for shipping purposes that helps in the rapid identification by emergency response teams. The prefix used, UN, designates the United Nations, meaning that these numbers are recognized worldwide.

Eductor Tube A tube inside a cylinder which allows for liquid withdrawal from the bottom of the cylinder when the valve is opened.

Effluent Splitter The part of an analytical instrument which divides the effluent stream into smaller segments and diverts them to different detectors.

Electron Capture Detector Chromatographic detector used commonly for halogenated compounds. Electrons are generated by a radioactive source and are captured by the species being monitored. The current drop across two plates is measured.

Environmental Protection Agency (EPA) The governmental agency responsible for environmental standards in the United States.

EPA Protocol Mixture Standard gas mixture prepared and analyzed following EPA-600/R-97/121 guidelines. These standards are required for calibration purposes when EPA analytical methods must be followed.

Exposure Limits Concentration of substances under which it is believed that nearly all workers can be repeatedly exposed on a daily basis without adverse effects.

Fahrenheit A temperature scale that has been set up so that ice melts at 32° and water boils at 212°.

Flame Ionization Detector (FID) One of the most commonly used detectors for measuring organic compounds in a gas stream. Organic species are decomposed by a hydrogen flame and measured by electrodes near the flame.

Flammable Gas DOT definition of any gas which either will form a flammable mixture with air at concentrations of 13% or less by volume or have a flammable range wider than 12% regardless of the lower explosive limit (LEL).

Flammability Limits The extremes of the range at which a gas mixed with air can be ignited with a source of ignition. The lower number is referred to as the lower explosive limit (LEL), and the upper number is called the upper explosive limit (UEL).

Flash Point The lowest temperature at which a flammable liquid will give off enough fumes to form an ignitable mixture with air directly above the liquid surface.

Gas A state of matter in which the individual molecules are almost totally unrestricted by cohesive forces. An ideal gas is one which obeys the gas laws under standard conditions.

Gas Processing Association (GPA) Organization consisting of both member companies and suppliers to the Gas Processing Industry. This organization was established to exchange technology related to the industry and to develop standards applying to the processing of gas products.

Gay-Lussac's Law One of the gas laws which states that for an ideal gas under constant pressure, the volume increase is proportional to the increase in temperature.

Gross Weight The total weight of both the container and the contents therein.

Halocarbons A family of compounds made up of a hydrocarbon combined with one or more halogens from the group VIIA elements in the Periodic Table. This name is commonly attributed to those compounds in the family which are used for refrigeration systems.

Heat of Adsorption The total heat generated from the initial adsorption of a compound on an adsorbate to the point at which equilibrium conditions are met and no more adsorption can take place.

Heat of Fusion The heat energy required to convert one mole of substance from the solid phase to the liquid phase at one atmosphere of pressure.

Heat of Vaporization The heat energy needed to transform one mole of substance from the liquid phase to the gas phase at one atmosphere of pressure.

Hydrocarbon An organic compound which contains both carbon and hydrogen in its molecular structure.

Inductively Coupled Plasma (ICP) An instrument used in atomic emission spectroscopy primarily for the quantitative analysis of trace metals in solids or liquids.

Inert Gas A gas which is considered stable and does not react with other materials at normal temperatures and pressures.

Inorganic Compounds Substances which do not contain carbon in their molecular structure.

Irritant A substance which causes inflammation of living tissue but does not cause irreversible damage.

Isotopes Forms of an element that have the same structure but differ from each other only in atomic mass. These slight changes in atomic mass often lead to instability and radioactivity.

Kelvin A temperature scale related to the triple point of water.

Level of Detection In chromatography, the amount of sample in a stream necessary to produce a peak height two to three times the baseline noise height.

Liquefied Compressed Gas A gas which under charged pressure is partially liquid at 70°F (21.1°C).

Liquified Petroleum Gas (LPG) A term generally used to describe those hydrocarbon gases which exist as liquids at normal temperature and pressure.

Lower Explosive Limit (LEL) The minimum percent by volume of a gas in air which forms a flammable mixture at normal temperatures and pressures.

Manifold A device having a single outlet but several inlets to which cylinders can be connected for multiple usage at the same time.

Material Safety Data Sheet (MSDS) A data sheet for a particular substance describing the characteristics and hazards associated with the handling and use of this product.

Melting Point The temperature at which the solid and liquid phase of a substance are at equilibrium (normally given for 1 atmosphere of pressure).

Micron A unit of length equivalent to 1×10^{-6} meters.

Mole Mass equivalent to the molecular weight of a substance. It is commonly expressed as gram-mole, the molecular weight in grams.

Molecular Weight The sum of all the atomic weights of the atoms which make up a single molecule of a substance.

Nanogram (ng) Mass equivalent to 1×10^{-9} grams.

Nanometer (nm) Length equivalent to 1×10^{-9} meters.

National Formulary (NF) A supplement to the United States Pharmacopoeia (USP).

Normal Temperature and Pressure A reference base for the gas industry of 70°F temperature and 14.696 psia pressure.

Nuclear Magnetic Resonance Spectrometer (NMR) An analytical instrument normally used for the qualitative identification of compounds containing hydrogen. The device measures the absorption of radio frequency waves by hydrogen molecules as they are electromagnetically excited.

Occupational Safety and Health Administration (OSHA) Organization within the Department of Labor which sets standards for employers to ensure a safe working environment for its employees.

Oxidizing Agent A substance that supports or causes combustion of other materials.

Parts per Million (PPM) A method of expressing low concentrations of impurities in a mixture. The unit can be expressed in moles, volume or weight per million of the same units. Lower concentration may be expressed in parts per billion (ppb) or parts per trillion (ppt).

Permissible Exposure Limit (PEL) Maximum routine exposure levels for different substances in the work environment as set by OSHA.

Poison A substance that in small dosages can cause death or serious impairment to organs when entering a living organism by either ingestion, injection, absorption or inhalation.

Pyrophoric A substance that can spontaneously ignite when exposed to air at temperatures of 130° F or below.

Rare Gas Those constituents of air that make up less than 1% of air and are generally considered inert. Examples include the gases in the far right column of the Periodic Table.

Restrictive Flow Orifice (RFO) A safety device placed in the outlet of a valve that limits the release rate of a hazardous gas to a maximum specified range in the event of accidental opening of the valve or failure of the gas containment system downstream.

Safety Relief Device A device usually incorporated into the valve of a cylinder, actuated by either pressure or temperature at predetermined limit to prevent rupture of the vessel.

Self Venting Device A device on certain types of regulators that relieves the outlet pressure as the regulator pressure is reduced.

Span Gas A calibration gas that is used to set the maximum reading on the scale of an analyzer.

Specific Gravity The ratio of the mass of one substance to that of a standard substance. For gases the reference is air (air = 1).

Specific Heat The amount of heat required to raise that temperature of a unit mass of a substance one degree at either constant temperature or volume.

Standard Temperature and Pressure (STP) An internationally recognized reference of a standard temperature of 0°C and standard pressure of 14.6960 psia.

Sublimation The direct passage of some substances from the solid state to the gaseous state without going through the liquid state first.

Tare Weight The weight of an empty cylinder without a valve or cap.

Thermoconductivity Detector (TCD) One of the earliest detectors used in gas chromatography. This detector operates as one leg of a Wheatstone bridge that detects slight changes in conductivity as the exposed wire changes temperature. Also, sometimes this type of detector is referred to as a hot wire detector.

Threshold Limit Value (TLV) Maximum standards set by ACGIH for airborne hazardous substances below which workers can be routinely exposed without adverse effects.

Threshold Limit Value-Ceiling (TLV-C) Airborne concentration of a substance which should not be exceeded.

Threshold Limit Value/Short Term Exposure Limit (TLV/STEL) Refers to a 15 minute time weighted average exposure for substances which should not be exceeded at any time during a workday.

Threshold Limit Value/Time Weighted Average (TLV/TWA) Refers to the time weighted average over a normal 8 hour workday and a 40 hour week to which all workers may be repeatedly exposed without adverse effect.

Toxic A substance which has the ability to produce injurious or lethal effects through its chemical interaction with the body.

Triple Point The defined pressure and temperature for a pure substance at which the three phases all exist in equilibrium.

Vapor Pressure The pressure exerted by the vapor above a liquid when the two phases are in equilibrium.

Zero Gas Calibration gas used to set the minimum reference point on the scale of an analyzer.