



Designation: D 1356 – 00a

## Standard Terminology Relating to Sampling and Analysis of Atmospheres<sup>1</sup>

This standard is issued under the fixed designation D 1356; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

### 1. Scope

1.1 This terminology is a collective vocabulary relating to sampling and analysis of atmospheres. As a convenience to general interest, it contains most of the standard terms, definitions, and nomenclature under the jurisdiction of Committee D22.

1.2 Many of the entries in this terminology are copied (with attribution) from the standards of origin referenced in Section 2. The standards of origin are noted in bold type at the right margin of the applicable definition.

1.3 Certain terms in the common language that comprise multiple concepts are included herein with the definition specific to standards and practices of Committee D22.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

- D 1357 Practice for Planning the Sampling of the Ambient Atmosphere<sup>2</sup>
- D 3249 Practice for General Ambient Air Analyzer Procedures<sup>2</sup>
- D 3614 Guide for Laboratories Engaged in Sampling and Analysis of Atmospheres and Emissions<sup>2</sup>
- D 3631 Test Methods for Measuring Surface Atmospheric Pressure<sup>2</sup>
- D 3670 Guide for Determination of Precision and Bias of Methods of Committee D22<sup>2</sup>
- D 3686 Practice for Sampling Atmospheres to Collect Organic Compound Vapors (Activated Charcoal Tube Adsorption Method)<sup>2</sup>
- D 3687 Practice for Analysis of Organic Compound Vapors Collected by the Activated Charcoal Tube Adsorption Method<sup>2</sup>
- D 4023 Terminology Relating to Humidity Measurements<sup>2</sup>
- D 4096 Test Method for Determination of Total Suspended Particulate Matter in the Atmosphere (High-Volume Sampler Method)<sup>2</sup>

- D 4240 Test Method for Airborne Asbestos Concentration in Workplace Atmosphere<sup>3</sup>
- D 4298 Guide for Intercomparing Permeation Tubes to Establish Traceability<sup>2</sup>
- D 5011 Practices for Calibration of Ozone Monitors Using Transfer Standards<sup>2</sup>
- D 5015 Test Method for pH of Atmospheric Wet Deposition Samples by Electrometric Determination<sup>2</sup>
- D 5096 Test Method for Determining the Performance of a Cup Anemometer or Propeller Anemometer<sup>2</sup>
- D 5111 Guide for Choosing Locations and Sampling Methods to Monitor Atmospheric Deposition at Non-Urban Locations<sup>2</sup>
- D 5366 Test Method for Determining the Dynamic Performance of a Wind Vane<sup>2</sup>
- D 5438 Practice for Collection of Floor Dust for Chemical Analysis<sup>2</sup>
- D 5527 Practices for Measuring Surface Wind and Temperature by Acoustic Means<sup>2</sup>
- E 104 Practice for Maintaining Constant Relative Humidity by Means of Aqueous Solutions<sup>2</sup>

### 3. Terminology

**absolute temperature**—See **temperature**.

**absolute filter**—See **filter**.

**absorbance**, *n*—the logarithm to the base of 10 of the reciprocal of *transmittance*.

**absorbate**, *n*—material that has been retained by the process of absorption.

**absorbent**, *n*—material in which absorption occurs.

**absorption**, *n*—a process in which one material (the absorbent) takes up and retains another (the absorbate) with the formation of an homogeneous mixture having the attributes of a solution.

DISCUSSION—Chemical reaction may accompany or follow absorption.

**acceptance angle** ( $\pm\alpha$ , deg), *n*—the angular distance, centered on the array axis of symmetry, over which the following conditions are met: (a) wind components are unambiguously defined, and (b) flow across the transducers

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 11.03.

<sup>3</sup> Discontinued; see 1995 *Annual Book of ASTM Standards*, Vol 11.03.

is unobstructed or remains within the angular range for which transducer shadow corrections are defined. **D 5527**

**accrediting authority, n**—a body that evaluates the capability of a testing agency or an inspection agency, or both, in certain specific fields of activity. **D 3614**

**accretion, n**—a phenomenon consisting of the increase in size of particles by the process of external additions.

**accuracy, n**—the degree of conformity of a value generated by a specific procedure to the assumed or accepted true value and includes both precision and bias. **D 3670**

**acoustic pathlength (d, (m)), n**—the physical distance between transducer transmitter-receiver pairs. **D 5527**

**activated charcoal, n**—activated charcoal refers to properly conditioned coconut-shell charcoal. **D 3686**

**adsorbate, n**—material that has been retained by the process of adsorption.

**adsorbent, n**—solid material on the surface of which adsorption takes place.

**adsorption, n**—a physical process in which molecules of gas, of dissolved substances, or of liquids, adhere in an extremely thin layer to the surfaces of solid bodies with which they are in contact.

**aerosol, n**—a dispersion of solid or liquid particles in a gaseous medium.

**agency, n**—an organization or part of an organization engaged in the activities of testing or inspection, or both. **D 3614**

**agglomeration, n**—a process of contact and adhesion whereby the particles of a dispersion form clusters of increasing size.

**air at normal conditions (standard air), n**—air at 50 % relative humidity, 25°C and 101.3 kPa (77°F and 760 mm Hg). See also **atmosphere**.

**air pollution, n**—the presence of unwanted material in the air.

**DISCUSSION**—The term *unwanted material* here refers to material in sufficient concentrations, present for a sufficient time, and under circumstances to interfere significantly with comfort, health, or welfare of persons, or with the full use and enjoyment of property.

**aliquot, n**—a representative portion of the whole that can be expressed as the inverse of an integer.

**ambient, adj**—surrounding on all sides.

**analyzer, n**—the instrumental equipment necessary to perform automatic analysis of ambient air through the use of physical and chemical properties and giving either cyclic or continuous output signal. **D 3249**

**analyzer system, n**—all sampling, analyzing, and readout instrumentation required to perform ambient air quality analysis automatically. **D 3249**

**full scale, n**—the maximum measuring limit for a given range of an analyzer. **D 3249**

**lag time, n**—the time interval from a step change in the input concentration at the analyzer inlet to the first corresponding change in the analyzer signal readout. **D 3249**

**linearity, n**—the maximum deviation between an actual analyzer reading and the reading predicted by a straight line drawn between upper and lower calibration points.

**DISCUSSION**—This deviation is expressed as a percentage of full scale. **D 3249**

**minimum detection limit, n**—the smallest input concentration that can be determined as the concentration approaches zero. **D 3249**

**noise, n**—random deviations from a mean output not caused by sample concentration changes. **D 3249**

**open path analyzer, n**—an analytical system that measures the average atmospheric or emission compound concentration along one or more monitoring paths open to the atmosphere. See **monitoring path**.

**operating humidity range of analyzer, n**—the range of ambient relative humidity of air surrounding the analyzer, over which the analyzer will meet all performance specifications. **D 3249**

**operating temperature range of analyzer, n**—the range of ambient temperatures of air surrounding the analyzer, over which the monitor will meet all performance specifications. **D 3249**

**operational period, n**—the period of time over which the analyzer can be expected to operate unattended within specifications. **D 3249**

**output, n**—a signal that is related to the measurement, and intended for connection to a readout or data acquisition device.

**DISCUSSION**—Usually this is an electrical signal expressed as millivolts or milliamperes full scale at a given impedance. **D 3249**

**range, n**—the concentration region between the minimum and maximum measurable limits. **D 3249**

**readout instrumentation, n**—output meters, recorder, or data acquisition system for monitoring analytical results. **D 3249**

**response time, n**—the time interval from a step change in the input concentration at the analyzer inlet to an output reading of 90 % of the ultimate reading. **D 3249**

**rise time, n**—response time minus lag time. **D 3249**

**sample system, n**—equipment necessary to provide the analyzer with a continuous representative sample. **D 3249**

**span drift, n**—the change in analyzer output over a stated time period, usually 24 h of unadjusted continuous operation, when the input concentration is at a constant, stated upscale value.

**DISCUSSION**—Span drift is usually expressed as a percentage change of full scale over a 24-h operational period. **D 3249**

**zero drift, n**—the change in analyzer output over a stated time period of unadjusted continuous operation when the input concentration is zero; usually expressed as a percentage change of full scale over a 24-h operational period. **D 3249**

See also **point analyzer**.

**analyzer system**—See **analyzer**.

**arrester, n**—a term for an air cleaning device.

**aspirated psychrometer**—See **psychrometer**.

**aspirator, n**—any apparatus such as a squeeze bulb, fan, pump, or venturi that produces a movement of a fluid by suction.

**atmosphere**, *n*—the gaseous envelope which surrounds the earth and includes ambient air, indoor air, and workplace air. See also **air at normal conditions**.

*synthetic atmosphere*, *n*—a specific gaseous mass containing any number of constituents and in any proportion produced for a special purpose.

**backdrafting**, *n*—the reversal of the normal (upward) direction of air flow in a vent for a vented combustion appliance (boiler, fireplace, furnace, or water heater), when the vented appliance is operating.

**bias**, *n*—a systematic (nonrandom) deviation of the method average value or the measured value from an accepted value.

**D 3670**

*laboratory bias*, *n*—systematic differences between the true value and a value reported by a laboratory due to errors of application such as losses, contamination, miscalibration, and faulty manipulations, for example.

**D 3670**

*method bias*, *n*—systematic departures of the limiting mean from the true value of the parameter measured caused by physical or chemical phenomena inherent in the methodology.

**D 3670**

**breathing zone**, *n*—that location in the atmosphere at which persons breathe.

**bubbler**, *n*—a sampling device consisting of a gas disperser immersed in an absorbing liquid.

*fritted bubbler*, *n*—a bubbler having a frit as the gas disperser.

**candidate method**, *n*—an analytical method or measurement process being considered for standardization.

DISCUSSION—A method is a *candidate* until completion of all phases of the consensus process specified by ASTM regulations for a proposal, an emergency standard, or a standard.

**D 3670**

*cascade impactor*—See **impactor**.

*carpet-embedded dust*—See **dust**.

**chemisorption**, *n*—adsorption, especially when irreversible, by means of chemical forces in contrast with physical forces.

**chimney effect**, *n*—a phenomenon consisting of a vertical movement of a localized mass of air or other gases due to temperature differences.

**cloud**, *n*—any collection of particulate matter in the atmosphere dense enough to be perceptible to the eye, especially a collection of water drops.

*cloud water*, *n*—an aggregate of condensed water vapor or ice crystals that are suspended in the atmosphere.

DISCUSSION—Cloud water droplet sizes are typically less than those of precipitation, measuring between 1 and 100  $\mu\text{m}$  in diameter.

**D 5111**

*cloud water*—See **cloud**.

**coalescence**, *n*—a process by which the particles of a dispersion combine into one body.

**collaborative test**, *n*—an interlaboratory study of a test method wherein the participants analyze or make measurements on subsamples of the same test material.

DISCUSSION—If the test method includes the sampling of atmospheres, the participants should sample the same test atmosphere, as possible.

**D 3670**

*collection efficiency*—See **efficiency**.

**collector**, *n*—a device for removing and retaining contaminants from air or other gases.

DISCUSSION—Usually this term is applied to cleaning devices in exhaust systems.

**colorimeter**, *n*—an instrument used for color measurement based on optical comparison with standard colors.

**combustion system downdrafting**, *n*—the reversal of the ordinary (upward) direction of air flow in a combustion system when vented combustion appliances are not operating.

DISCUSSION—The term “cold backdrafting” is used synonymously with combustion system downdrafting.

**combustion system spillage**, *n*—entry of combustion products into a building, caused by backdrafting, vent blockage, or a leaky heat exchanger.

**concentration**, *n*—the quantity of a substance contained in a total unit quantity of sample.

*mass concentration*, *n*—concentration expressed in terms of mass of substance per unit volume of gas or liquid.

*ppb(v)*, *n*—a unit of measure of the concentration of gases in air expressed as parts of the gas per billion ( $10^9$ ) parts of the air-gas mixture, both by volume.

*ppm(v)*, *n*—a unit of measure of the concentration of gases in air expressed as parts of the gas per million parts of the air-gas mixture, both by volume.

*vapor concentration*, *n*—concentration expressed in terms of gaseous volume of substance per unit volume of air or other gas usually expressed in percent or parts per million by volume. See also **absolute humidity**.

*volume concentration*, *n*—concentration expressed in terms of gaseous volume of substance per unit volume of air or other gas usually expressed in percent or parts per million.

**condensate**, *n*—liquid or solid matter formed by condensation from the vapor phase.

DISCUSSION—In sampling, the term is applied to the components of an atmosphere which have been isolated by simple cooling.

**condensation**, *n*—the process of converting a material in the gaseous phase to a liquid or solid state by decreasing temperature or by increasing pressure, or both.

DISCUSSION—Usually in air sampling only cooling is used.

*condensation sampling*—See **sampling**.

**condensoid**, *n*—the particles of a dispersion formed by condensation.

*constant flow high-volume sampler*—See **sampler**.

**contaminant**, *n*—a material added by human or natural activities which may, in sufficient concentrations, render the atmosphere unacceptable.

DISCUSSION—Contaminants refer to gases, vapors, mists, aerosols, fumes, particles, or dusts, and so forth, that are airborne. The term does not apply to elements that make up the components of the earth's atmosphere, such as nitrogen, oxygen, argon, and so forth. **D 1357**

*continuous sampling*—See **sampling**.

*controlled-pore filter*—See **filter**.

**count median size**, *n*—a measurement of particle size of

samples of particulate matter, consisting of that diameter of particle such that one half of the number of particles is larger and half is smaller.

*cumulative sample*—See **sample**.

**delay distance** ( $D$ ),  $n$ —the distance the air flows past a wind vane during the time it takes the vane to return to 50 % of the initial displacement. **D 5366**

**density**,  $n$ —the mass per unit volume of substance.

**denuder**,  $n$ —a device designed to collect or remove gases from an air stream by diffusion to a collecting surface or secondary air stream while permitting the passage of particles. **D 5111**

**deposition**,  $n$ —the transfer of an atmospheric constituent to a surface due to gravity or another mechanism, or the material which is transferred.

*dry deposition*,  $n$ —all forms of deposition derived from the net vertical transfer of chemical species to a surface that are not the result of precipitation.

DISCUSSION—Dry deposition includes both turbulent diffusion and gravitational settling. Dew and frost are anomalous forms of dry deposition which rely upon a near-surface condensation process as their principle means of effecting the net vertical transfer. **D 5111**

*wet deposition*,  $n$ —the precipitation of water from the atmosphere in the form of hail, rain, sleet, and snow.

DISCUSSION—Deposits of dew, fog, and frost are excluded. See also *meteorological precipitation* under **precipitation**. **D 5111**

**desorption**,  $n$ —the process of freeing from a sorbed state.

**dew**,  $n$ —water vapor that has condensed onto a surface near the ground because of radiational cooling of that surface to a temperature that is below the dew point of the air surrounding the surface. **D 5111**

**dew cell**, **dew probe**,  $n$ —an instrument that measures the temperature at which a saturated salt solution (usually of lithium chloride) is in equilibrium with the water vapor in moist air. **D 4023**

*dew-frost-point hygrometer*—See **hygrometer**.

*dew-point temperature*—See **temperature**.

*dew probe*—See **dew cell**.

*diffusion, molecular*—See **molecular diffusion**.

**dispersion**,  $n$ —the most general term for a system consisting of particulate matter suspended in a fluid.

**dispersoid**,  $n$ —the particles of a dispersion.

**distance constant** ( $L$ ,  $m$ ),  $n$ —the distance the air flows past a rotating anemometer during the time it takes the cup wheel or propeller to reach  $(1 - 1/e)$  or 63 % of the equilibrium speed after a step change in wind speed.

DISCUSSION—The response of a rotating anemometer to a step change in which wind speed increases instantaneously from  $U = 0$  to  $U = U_f$  is:

$$U_t = U_f(1 - e^{-t/\Gamma})$$

where

- $U_t$  = instantaneous indicated wind speed at time  $t$ , m/s,
- $U_f$  = final indicated wind speed, or wind tunnel speed, m/s,
- $t$  = elapsed time after the step change occurs, s, and
- $\Gamma$  = time constant of the instrument.

Distance constant is:  $L = U_f\Gamma$

**diurnal**, *adj*—recurring daily.

DISCUSSION—Applied to (variations in concentration of air contaminants, diurnal indicates variations that follow a distinctive pattern and which recur from day to day.

**DOP**,  $n$ —dioctyl phthalate (di-2-ethylhexyl phthalate).

**droplet**,  $n$ —a small liquid particle of such size and density as to fall under still conditions but which may remain suspended under turbulent conditions.

*dry-bulb temperature*—See **temperature**.

*dry deposition*—See **deposition**.

*dry impingement*—See **impingement**.

**dust**,  $n$ —a general term, depending upon application, applied to solid particles predominantly larger than colloidal and capable of temporary suspension in air or other gases.

DISCUSSION—Dusts tend to flocculate under electrostatic forces and settle under the influence of gravity. They are typically formed from larger masses through the application of physical forces.

*dust loading*,  $n$ —an engineering term for *dust concentration*, usually applied to the contents of collection ducts and the emissions from stacks.

*carpet-embedded dust*,  $n$ —soil and other particulate matter, approximately 5- $\mu$ m equivalent aerodynamic diameter and larger, embedded in carpet pile and normally removable by household vacuum cleaners. **D 5438**

*surface dust*,  $n$ —soil and other particulate matter, approximately 5- $\mu$ m equivalent aerodynamic diameter and larger, adhering to floor surfaces and normally removable by household vacuum cleaners. **D 5438**

*dustfall*—See *particle fall* under **particle**.

*dust loading*—See **dust**.

**efficiency**,  $n$ —a measure of the performance of a collector.

DISCUSSION—Usually it is the ratio of the amount collected to the inlet loading, expressed in percentage.

*collection efficiency*,  $n$ —the percentage of a specified substance retained by a gas cleaning or sampling device.

*fractional efficiency*,  $n$ —the mean collection efficiency for specific size fractions of a contaminant.

DISCUSSION—Commonly this term has been applied to the performance of air cleaning equipment towards particulate matter in various size ranges.

**ejector**,  $n$ —a device that uses a fluid under pressure, such as steam, air, or water, to move another fluid by developing suction through differential pressure.

DISCUSSION—Suction is developed by discharging the fluid under pressure through a venturi.

**electrical conductivity**,  $n$ —the property of a fluid or solid that permits the passage of an electrical current as a result of an impressed emf.

DISCUSSION—It is measured by the quantity of electricity transferred across unit area per unit potential gradient per unit time. (In sampling and analysis, changes in this property are utilized to measure the presence of certain ions and compounds such as sulfur dioxide.)

*electric hygrometer*—See **hygrometer**.

*electrostatic precipitation*—See **precipitation**.

*electrostatic precipitator*—See **precipitator**.

**elute**, *v*—to remove sorbed materials from a sorbent by means of a fluid.

**emission mixture**, *n*—the total mixture in the outside atmosphere of emissions from all sources.

**emissions**, *n*—substances discharged into the air from a stack, vent, or other discrete source.

*emission rate*, *n*—the mass emitted per unit of time from a source or, alternatively, per unit of material or energy produced or consumed by a process.

**enhancement factor**, *n*—the correction for the departure of the mixture of air and water vapor from ideal gas laws.

**D 4023**

*event sampling*—See **sampling**.

**exposure**, *n*—contact with a chemical, biological, physical or other agent over a specified time period.

DISCUSSION—Exposure is expressed as the integral of the concentration (or intensity) of the agent at the boundary of the receptor over the time period of contact, that is,  $E \sim \int \{C(t)\} dt$

**filter**, *n*—a porous medium for collecting particulate matter.

*absolute filter*, *n*—a filter or filter medium of ultra-high collection efficiency for very small particles (submicrometre size) so that essentially all particles of interest or of concern are collected.

DISCUSSION—Commonly, the efficiency is in the region of 99.95 % or higher for a standard aerosol of 0.3- $\mu$ m diameter (see Practice D 2986).

**D 4096**

*controlled-pore filter*, *n*—a filter of various plastics or metals having a structure of controlled uniform pore size.

DISCUSSION—Sometimes referred to as a membrane or molecular filter.

**flocculation**, *n*—synonymous with agglomeration.

**flowmeter**, *n*—an instrument for measuring the rate of flow of a fluid (that is, liquid or gas) moving through a system.

DISCUSSION—The instrument is calibrated to give volume or mass rate of flow.

**fly ash**, *n*—the finely divided particles of ash entrained in flue gases arising from the combustion of fuel.

DISCUSSION—The particles of ash may contain incompletely burned fuel. The term has been applied predominantly to the gas-born ash from boilers with spreader stoker, underfeed stoker, and pulverized fuel (coal firing).

**fog**, *n*—a visible aggregate of condensed water vapor or ice crystals suspended in the atmosphere near the earth's surface.

DISCUSSION—Fog differs from cloud water only that it resides very close to the earth's surface.

**D 5111**

*fractional efficiency*—See **efficiency**.

**fractionation**, *n*—the process of separating a mixture into components having different properties (as by distillation, precipitation, or screening).

**frit**, *n*—a porous material permeable to gas flow usually made by sintering microbeads of an appropriate material.

*fritted bubbler*—See **bubbler**.

**frost**, *n*—ice crystals resulting from the direct sublimation of water vapor onto a surface that is below freezing.

DISCUSSION—Frost is due to radiational cooling and only occurs when the temperature of the air in contact with the surface falls below the freezing point of water.

**D 5111**

*frost-point hygrometer*—See **dew-/frost-point hygrometer** under **hygrometer**.

*frost-point temperature*—See **temperature**.

*full scale*—See **analyzer**.

**fume**, *n*—properly, the solid particles generated by condensation from the gaseous state, generally after volatilization from melted substances, and often accompanied by a chemical reaction such as oxidation.

DISCUSSION—Fumes flocculate and sometimes coalesce. Popularly, the term is used in reference to any or all types of contaminant, and in many laws or regulations with the added qualification that the contaminant have some unwanted action.

*gage pressure*—See **pressure**.

**gas**, *n*—one of the states of matter, having neither independent shape nor volume and tending to expand indefinitely.

**gas meter**, *n*—an instrument for measuring the quantity of a gas passing through the meter.

**gasometer**, *n*—an apparatus employing a calibrated volume which is used to calibrate gas-measuring devices.

**generic criteria**, *n*—common characteristics pertaining to organizations' human resources, material resources, and quality systems which provide a basis for assessing the qualifications of testing or inspection agencies.

**D 3614**

**gustiness**, *adj*—now referred to as intensity of turbulence which is defined as the ratio of the root mean square of wind velocity fluctuations to the mean wind velocity.

*Hi-Vol (high-volume air sampler)*—See **sampler**.

**house depressurization**, *n*—the situation, pertaining to a specific location in a house, whereby the static pressure at that location is lower than the static pressure in the immediate vicinity outside the house.

DISCUSSION—The pressure difference between indoors and outdoors is affected by building tightness (including the distribution of leakage sites across the building envelope), indoor temperature difference, local winds, and the operation of indoor appliances such as exhaust fans, forced-air system fans, and vented combustion appliances (boilers, fireplaces, furnaces, or water heaters). The existence and extent of house depressurization at a specific location, thus, varies over time depending on outdoor conditions and the operation of indoor appliances.

**human resources**, *n*—those elements of support or capability that are provided by humans using their mental and physical capabilities.

**D 3614**

**humidity**, *n*—a measure of the amount of water vapor in a gas. Also see **absolute humidity** and **relative humidity**.

*absolute humidity*, *vapor concentration*, *vapor density* ( $d_v$ ), *n*—the ratio of the mass of water vapor,  $m_v$ , to the total volume of the moist air,  $v$ :

$$d_v = \frac{m_v}{v}$$

**D 4023**

*relative humidity, n*—the ratio of the actual water vapor pressure to the saturation pressure.

*relative humidity with respect to ice ( $U_i$ )*, *n*—the ratio in percent of the mole fraction of water vapor,  $x_v$ , in moist air to the mole fraction of water vapor,  $x_{vi}$ , that the moist air would have if it were saturated with respect to ice at the same pressure,  $p$ , and temperature,  $t$ .

$$U_i = \frac{X_v}{X_{vi}} \times 100$$

DISCUSSION—If the water vapor and air are assumed to behave as ideal gases, then

$$U_i = \frac{e}{e_i} \times 100$$

where  $e$  is the partial pressure of the water vapor in the moist air and  $e_i$  is the saturation vapor pressure with respect to ice at the same temperature,  $t$ . **D 4023**

*relative humidity with respect to water ( $U_w$ )*—the ratio in percent of mole fraction of water vapor,  $x_v$ , in moist air to the mole fraction of water vapor,  $x_{vw}$ , that the moist air would have if it were saturated with respect to water at the same pressure,  $p$ , and temperature,  $t$

$$U_w = \frac{X_v}{X_{vw}} \times 100$$

DISCUSSION—If water vapor and air are assumed to behave as ideal gases, then

$$U_w = \frac{e}{e_w} \times 100$$

where  
 $e$  = partial pressure of the water vapor in the moist air and  
 $e_w$  = saturation vapor pressure with respect to water at the same temperature,  $t$ .

**D 4023**

*relative humidity with respect to ice*—See **relative humidity**.  
*relative humidity with respect to water*—See **relative humidity**.

*humidity range*—See **operating humidity range of analyzer under analyzer**. See also **operating humidity range of sample under sample**.

**hygrometer, n**—an instrument for measuring the humidity of a gas.

*dew/frost-point hygrometer, n*—an instrument that measures the surface temperature at which ambient water vapor condenses. **D 4023**

*electric hygrometer, n*—an instrument that determines the water vapor content of an atmosphere by measuring the change in resistance or capacitance of hygroscopic material. **D 4023**

*mechanical hygrometer, n*—an instrument for determining the water vapor content of an atmosphere by measuring the dimensional change produced in an hygroscopic material. **D 4023**

*ice-bulb temperature*—See **temperature**.

**impaction, n**—a forcible contact of particles of matter, a term often used synonymously with impingement.

**impactor, n**—a device for collecting airborne or emission

particulate matter in which the air or gas being sampled is impacted or impinged against a surface.

*cascade impactor, n*—a type of impactor which employs several stages of impaction in series to collect successively smaller sizes of particles.

**impingement, n**—the act of bringing matter forcibly in contact.

DISCUSSION—As used in air sampling, impingement refers to a process for the collection of particulate matter in which the gas being sampled is directed forcibly against a surface.

*dry impingement, n*—the process of impingement carried out so that particulate matter carried in the gas stream is retained upon the surface against which the stream is directed.

DISCUSSION—The collecting surface may be treated with a film of adhesive.

*wet impingement, n*—the process of impingement carried out within a body of liquid, the latter serving to retain the particulate matter.

**impinger, n**—broadly, a sampling instrument employing impingement of the collection of particulate matter.

DISCUSSION—Commonly, this term is applied to specific instruments, the *midget* and *standard* Impinger.

*midget impinger, n*—a specific instrument employing wet impingement, using a liquid volume of 10 mL and a gas flow of 2.8 L/min.

DISCUSSION—See Littlefield, J. R., Feicht, E. L., and Schrenk, H. H., “Midget Impinger for Dust Sampling,” *Report of Investigations 3360*, U.S. Bureau of Mines, 1937.

*standard impinger, n*—a specific instrument employing wet impingement, using a liquid volume of 75 mL and a gas flow of 28 L/min.

DISCUSSION—See Greenburg, L., and Smith, G. W., “A New Instrument for Sampling Aerial Dust,” *Report of Investigations 2392*, U.S. Bureau of Mines, 1922. See also Hatch, T., Warren, H., and Drinker, P., *Journal Industrial Hygiene*, No. 14, 1932, p. 301.

**inspection, n**—the process of measuring, examining, testing, gaging, or otherwise evaluating materials, products, services, systems, or environments. **D 3614**

*instantaneous sampling*—See **sampling**.

**interference, n**—an undesired output caused by a substance or substances other than the one being measured.

DISCUSSION—The effect of interfering substance(s), on the measurement of interest, shall be expressed as: ( $\pm$ ) percentage change of measurement compared with the molar amount of the interferant. If the interference is nonlinear, an algebraic expression should be developed (or curve plotted) to show this varying effect. **D 3249**

*intermittent sampling*—See **sampling**.

**inversion, n**—a reversal of the normal atmospheric temperature gradient, thus an increase of temperature of the air with increasing altitude.

*isokinetic sampling*—See **sampling**.

*laboratory bias*—See **bias**.

*lag time*—See **analyzer**.

**lapse rate, n**—the rate of change of the absolute value of any