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Standard Terminology Relating to Moisture in Textiles[1]

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1. Scope

1.1 This terminology is a compilation of definitions of technical terms related to moisture in textiles. Terms that are generally understood or adequately defined in other readily available sources are not included.

1.2 For other ASTM defined conditioning terms, refer to Terminology E 41. For other terms associated with textiles, refer to Terminology D 123, Relating to Textiles.

2. Referenced Documents

2.1 *ASTM Standards:*
D 123 Terminology Relating to Textiles[2]
E 41 Terminology Relating to Conditioning[3]

3. Terminology

3.1 *Definitions:*

absolute humidity, *n*—the mass of water vapor present in a unit volume of air.

DISCUSSION—Common units of measure for absolute humidity are grams per cubic metre or grains per cubic foot. The amount of water vapor is also reported in terms of mass per unit mass of dry air, for example, grams per kilogram, or grains per pound, of dry air. This value differs from values calculated on a volume basis and should not be referred to as **absolute humidity**. It is designated as humidity ratio, specific humidity, or **moisture pick-up**.

absorption, *n*—a process in which one material (the absorbent) takes in or absorbs another (the absorbate); as the absorption of moisture by fibers. (See also **adsorption**, and **moisture equilibrium for testing**. Compare **desorption** and **resorption**.) **D 4772**

adsorption, *n*—a process in which the surface of a solid takes on or adsorbs in an extremely thin layer molecules of gases, of dissolved substances, or of liquids with which it is in contact. (See also **absorption** and **moisture equilibrium for testing**. Compare **desorption** and **resorption**.)

atmosphere for testing, *n*—air at ambient conditions of relative humidity and temperature in which tests or experiments are conducted. (See also **standard atmosphere for testing**.)

DISCUSSION—In the hierarchy of terms, *atmosphere* is the generic term where the air is ambient with conditions "controlled" by local weather and therefore variable. **Atmosphere for testing** is a delimited term in which the use of the atmosphere is restricted for a certain purpose. In a **standard atmosphere for testing**, the conditions are specified (standardized) and controlled for routine testing and for testing reproducibility. On this basis, there is no real reason for not referring to the specified atmospheres that have been traditionally used for testing glass textiles or tire cords, etc., as **standard atmospheres for testing** those materials.

commercial allowance (CA), *n*—an arbitrary value, equal to the commercial moisture regain, plus a specified allowance for finish, used with the mass of scoured, oven-dried yarn, to compute (1) yarn linear density, (2) the commercial or legal mass of a shipment or delivery of any specific textile material (see also *commercial moisture regain*), or (3) the mass of a specific component in the analysis of fiber blends. **D 1907, D 2494, D 3887**

commercial mass, *n*—billed mass as determined by a generally accepted method or as agreed upon between the purchaser and seller. **D 2494**

commercial moisture content, *n*—*in wool*, the moisture calculated as a percentage of the mass of the wool, top, noils, yarn, fabric, etc., in the "as-is" condition; that is, containing whatever moisture, oil, grease, or other extraneous matter that may be present. **D 2118**

commercial moisture regain (CMR), *n*—a formally adopted, arbitrary value, to be used with the oven-dried mass of textile fibers, when calculating the commercial mass of a shipment or delivery.

DISCUSSION—The assigned commercial moisture regain value is usually higher than the experimental moisture regain value for the same material.

condition, *v*—to bring a material to moisture equilibrium with a specified atmosphere.

desorption, *n*—a process in which a sorbed material is released from another material, as the desorption of moisture from fibers; the reverse of absorption, adsorption, or both.

[1] This terminology is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.51 on Chemical Conditioning and Performance.

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[2] *Annual Book of ASTM Standards,* Vol 07.01.

[3] *Annual Book of ASTM Standards,* Vol 14.02.

dew point, *n*—the temperature below which condensation of water vapor begins to take place when the atmosphere is cooled.

DISCUSSION—As air is cooled, the amount of water vapor which it can hold decreases. If air is cooled sufficiently, the saturation water-vapor pressure becomes equal to the actual water-vapor pressure and any further cooling beyond this point will normally result in the condensation of moisture.

humidity, *n*—the condition of the atmosphere in respect to water vapor. (Compare **absolute humidity** and **relative humidity**.)

hygrometer, *n*—any instrument for measuring the humidity of the atmosphere.

moisture, *n*—*as used with textiles*, water absorbed, adsorbed, or resorbed by a material. (See also **water**.)

moisture as-is, *n*—deprecated term. See **moisture content**.

moisture as-received, *n*—deprecated term. See **moisture content**.

moisture content, *n*—that part of the total mass of a material that is absorbed or adsorbed water, compared to the total mass. (Compare **moisture pick-up** and **moisture regain**.)

DISCUSSION—Moisture is usually expressed as a percentage and is calculated using the equation:

$$C = 100\,(A - D)/A$$

where:
C = moisture content, %,
A = mass of material before drying, and
D = mass of the dried material.

There is a relationship between **moisture content** and **moisture pick-up** since both may be calculated from the same data. The difference is in the bases used for calculating the percentages, original versus dried material mass. The relationship between moisture content and moisture pick-up is shown by the equations:

$$C = 100\,P/(100 + P)$$

$$P = 100\,C/(100 - C)$$

where:
C = moisture content, %, and
P = moisture pick-up, %.

moisture content, *n*—*at moisture-equilibrium*, the moisture content of a material in equilibrium with air of known, or specified, temperature and relative humidity.

DISCUSSION—A frequently prescribed condition for determining **moisture content** at moisture-equilibrium is use of a standard atmosphere, for example, 21 ± 1°C (70 ± 2°F) and 65 ± 2 % relative humidity, for textiles, both in establishing the equilibrium and as air supply for the drying oven.

moisture content (dry-basis), *n*—deprecated term. See **moisture pick-up**.

moisture (dry-basis), *n*—deprecated term. See **moisture pick-up**.

moisture equilibrium, *n*—the condition reached by a material when it no longer takes up moisture from, or gives up moisture to, the surrounding atmosphere. (Compare **moisture-free**.)

DISCUSSION—The establishment of equilibrium between a material and the surrounding atmosphere is dependent upon the exposure time, the difference in moisture levels between the material and the atmosphere, and motion of the air about the material. The level at which the moisture in the textile reaches equilibrium depends upon the side from which equilibrium is approached. Because of this difference, equilibrium for textiles should be approached from the dry (but not moisture-free) side which is faster. Equilibrium with air in motion is considered to be achieved when successive weighings at specified time intervals do not show a change in mass greater than the tolerance established for the material. If there is no established tolerance, consider 0.1 % of the mass after a 2-h exposure as satisfactory.

moisture equilibrium, *n*—*for preconditioning*, the moisture condition reached by a material during free exposure to moving air in the standard atmosphere for preconditioning. **D 1776**

moisture equilibrium, *n*—*for testing*, the condition reached by a material during free exposure to moving air in a specified atmosphere for testing. **D 885, D 885M, D 1776**

moisture-free, *adj*—*in textiles*, a descriptive term for a material that (1) has been exposed to a flow of desiccated air at a specified temperature until there is no further significant change in mass, or (2) has been treated by a distillation process using a suitable solvent. (Syn. **zero-moisture**.) (Compare **moisture equilibrium**.)

DISCUSSION—Moisture determinations frequently involve the change in mass of an oven-dried specimen. If the air in the oven contains moisture, the oven-dried specimen will also contain some moisture even though it no longer shows a significant change in mass. This is due to the establishment of moisture equilibrium under the existing conditions. To ensure that the specimen is actually moisture-free, it must be exposed to desiccated air until it shows no further significant change in mass. Although heating textiles in dessicated air to temperatures as high as 110°C increases the rate of moisture loss without changing the final equilibrium mass of the moisture-free textile, heating also increases the possibility of removing other matter. The distillation process may be substituted provided the textile does not contain any distillable, water-soluble matter.

moisture pick-up, *n*—the mass of absorbed and adsorbed water that is held by a material, compared to the mass of the dried material. (Compare **moisture content** and **moisture regain**.)

DISCUSSION—Moisture pick-up is usually expressed as a percentage based on the dried mass of the material and is calculated using the equation:

$$P = 100\,(A - D)/D$$

where:
P = moisture pick-up, %
A = mass of material before drying, and
D = mass of the material after drying under specified conditions.

There is a relationship between **moisture pick-up** and **moisture content** since both may be calculated from the same data. The difference is in the bases used for calculating the percentages, original versus dried material mass. The relationship between moisture content and moisture pick-up is shown by the equations:

$$C = 100\,P/(100 + P)$$

$$P = 100\,C/(100 - C)$$