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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Terminology Relating to Hazardous Potential of Chemicals[1]

1. Scope

1.1 This standard is a compilation of terminology used in the area of hazard potential of chemicals. Terms that are generally understood or adequately defined in other readily available sources are not included.

1.2 In the interest of common understanding and standardization, consistent word usage is encouraged to help eliminate the major barrier to effective technical communication.

2. Referenced Documents

2.1 *ASTM Standards:*

E 476 Test Method for Thermal Instability of Confined Condensed Phase Systems (Confinement Test)[2]

E 487 Test Method for Constant-Temperature Stability of Chemical Materials[2]

E 537 Test Method for Assessing the Thermal Stability of Chemicals by Methods of Thermal Analysis[2]

E 659 Test Method for Autoignition Temperature of Liquid Chemicals[2]

E 680 Test Method for Drop Weight Impact Sensitivity of Solid-Phase Hazardous Materials[2]

E 681 Test Method for Concentration Limits of Flammability of Chemicals (Vapors and Gases)[2]

E 698 Test Method for Arrhenius Kinetic Constants for Thermally Unstable Materials[2]

E 771 Test Method for Spontaneous Heating Tendency of Materials[2]

E 918 Practice for Determining Limits of Flammability of Chemicals at Elevated Temperature and Pressure[2]

E 1226 Test Method for Pressure and Rate of Pressure Rise for Combustible Dusts[2]

E 1231 Practice for Calculation of Hazard Potential Figures-of-Merit for Thermally Unstable Materials[2]

E 1232 Test Method for Temperature Limit of Flammability of Chemicals[2]

3. Terminology

3.1 *Definitions:*

adiabatic decomposition temperature rise, $(T)_d$, *n*—an estimation of the computed temperature which a specimen would attain if all of the enthalpy (heat) of decomposition reaction were to be absorbed by the sample itself. High values represent high hazard potential. **(E 1231)**

anvil, *n*—the smooth, hardened surface upon which the test sample or cup containing the sample rests. **(E 680)**

Arrhenius equation—$k = Ze^{-E/RT}$ where k is the specific reaction rate constant in reciprocal minutes for first order, Z is the pre-exponential factor in reciprocal minutes, E is the Arrhenius activation energy in J/mol, R is the gas constant, 8.32 J/mol K, and T is the temperature in kelvin. **(E 698)**

autoignition, *n*—the ignition of a material commonly in air as the result of heat liberation due to an exothermic oxidation reaction in the absence of an external ignition source such as a spark or flame. **(E 659)**

autoignition temperature, *n*—the minimum temperature at which autoignition occurs under the specified conditions of test. **(E 659)**

Discussion—Autoignition temperature is also referred to as spontaneous ignition temperature, self-ignition temperature, autogenous ignition temperature, and by the acronyms AIT and SIT. AIT is the lowest temperature at which the substance will produce hot-flame ignition in air at atmospheric pressure without the aid of an external energy source such as spark or flame. It is the lowest temperature to which a combustible mixture must be raised, so that the rate of heat evolved by the exothermic oxidation reaction will over-balance the rate at which heat is lost to the surroundings and cause ignition.

constant-temperature stability (CTS) value—the maximum temperature at which a chemical compound or mixture may be held for a 2-h period under the conditions of the test without exhibiting a measurable exothermic reaction. **(E 487)**

cool-flame, *n*—a faint, pale blue luminescence or flame occurring below the autoignition temperature (AIT). **(E 659)**

Discussion—Cool-flames occur in rich vapor-air mixtures of most hydrocarbons and oxygenated hydrocarbons. They are the first part of the multistage ignition process.

critical half thickness, (a), *n*—an estimation of the half thickness of a sample in an *unstirred container,* in which the heat losses to the environment are less than the retained heat. This buildup of internal temperature leads to a thermal-runaway reaction. **(E 1231)**

critical temperature, (T_c), *n*—an estimation of the lowest temperature of an *unstirred container* at which the heat losses to the environment are less than the retained heat leading to a buildup of internal temperature. This temperature buildup leads to a thermal-runaway reaction. **(E 1231)**

Discussion—This description assumes perfect heat removal at the reaction boundary. This condition is not met if the reaction takes place

[1] This terminology is under the jurisdiction of ASTM Committee E-27 on Hazard Potential of Chemicals and is the direct responsibility of Subcommittee E27.01 on Dusts.

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