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GB/T 22232.2-2026

Test method for the thermal stability of chemicals - Part 2: Adiabatic calorimetry

化学物质的热稳定性测定 第2部分：绝热量热法

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Foreword

This document conforms to GB/T 1.1-2020 "Standardization Work Guidelines Part

1.Structure and Drafting Rules of Standardization Documents". Drafting is scheduled. This document is Part 2 of GB/T 22232.GB/T 22232 has the following parts published. --Part

2.Adiabatic heating method. Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying these patents. This document was proposed and is under the jurisdiction of the National Technical Committee on Standardization of Hazardous Chemicals Management (SAC/TC 251). This document was drafted by: Sinopec Safety Engineering Research Institute Co., Ltd., Chemical Registration Center of the Ministry of Emergency Management, and Ningbo Customs Technology Center. Heart, China University of Petroleum (Beijing), China National Accreditation Service for Conformity Assessment, Sinopec (Ningbo) Safety Technology Co., Ltd., Nanjing University of Science and Technology China Academy of Safety Science and Technology, Shanghai Chemical Industry Research Institute Testing Co., Ltd., Shenyang Chemical Industry Research Institute Co., Ltd., China Petroleum and Chemical Industry Research Institute Industry Federation, Hangzhou Yangyi Technology Co., Ltd., and Zhuhai Jintuan Chemical Co., Ltd. The main drafters of this document are. Dang Wenyi, Chen Youwei, Jin Manping, Chen Liping, Zhang Hongzhe, Zhang Jiedong, Li Yuntao, Zhang Fan, Sun Bing, and Sun Peiqin. Chen Sining, Wang Hao, Wu Juan, Wei Zhenyun, Li Lunhui, Cao Mengran, Xu Sen, Kong Xiangbei, Tu Yahui, Liu Xuan, Wang Ting, Sun Feng, Huang Fei, Zhang Jinmei, Tang Chenfei, Li Songping, Duan Dongquan, Wang Chen, Zhou Xintian, Yang Weihua, Li Wuping.

GB/T 22232 aims to establish a test method for the thermal stability of chemical substances, and is proposed to consist of three parts. --Part

2 Adiabatic heating method. --Part

3.Rapid Screening Calorimetry. Thermal stability is crucial for evaluating the safety of chemical substances and determining safe operating conditions during production, storage, transportation, and use. Parameters. Unstable chemical substances may undergo exothermic reactions such as decomposition and polymerization under heating conditions. If the accumulated heat cannot be dissipated in time, it will... This can cause a sharp rise in temperature and pressure, leading to serious accidents such as fires and explosions. GB/T 22232 aims to establish a system of methods for determining the thermal stability of chemical substances. Part 1, "Differential Scanning Calorimetry," is applicable to rapid... Quickly obtain basic thermal information such as phase transition, heat of reaction, and initial decomposition temperature of chemical substances for preliminary screening and comparison; Part 2 "Adiabatic" Calorimetry simulates the thermal behavior of chemical substances under adiabatic conditions to obtain the initial exothermic temperature, the amount of heat released during the reaction, the maximum reaction rate, and so on. The key safety parameters, such as arrival time, provide core data for process safety design and risk assessment; Part 3, "Rapid Screening Calorimetry," aims to... By utilizing a simple and efficient experimental design, we can quickly obtain basic thermal information such as the heat of reaction and initial decomposition temperature of chemical substances. Part 1, "Differential Scanning Calorimetry," and Part 3, "Rapid Screening Calorimetry," are typically used as preliminary screening and basic characterization methods. For early hazard identification and sample screening; Part 2, "Adiabatic Thermometry," is used for more accurate and realistic safety data measurement in hazardous scenarios. The three parts together constitute a complete methodology chain from rapid qualitative screening to accurate quantitative assessment, allowing users to tailor their approach to different security assessments. Depending on the stage and accuracy requirements, select the appropriate or combined methods. Determination of the thermal stability of chemical substances Part

2.Adiabatic Thermal Method Warning. This document should be used by personnel with prior experience in formal laboratory work. Use of this document may involve certain hazardous activities. Regarding materials, equipment, and operations, this document does not address all potential safety issues. Users are responsible for taking appropriate safety and health precautions. And ensure that it complies with the conditions stipulated by relevant national laws and regulations.

1.Scope This document describes the principles, instruments, calibration and verification, samples, test procedures, and test methods for determining the thermal stability of chemical substances using the adiabatic calorimetry method. Inspection report. This document applies to the determination of the thermal stability of liquid and solid chemical substances using adiabatic calorimetry.

5.1 Adiabatic calorimeter

5.1.1 The adiabatic calorimeter shall be able to measure, display, and record changes in temperature and pressure over time and/or temperature, and shall meet the following requirements.

a) The exothermic detection sensitivity is no greater than 0.02 °C/min;

b) The maximum test temperature shall not be less than 450 °C;

c) The temperature display resolution is not less than 0.01 °C;

d) The maximum test pressure shall not be less than 15 MPa;

e) The pressure display resolution is not less than 1 kPa.

5.1.2 The adiabatic calorimeter consists of a testing unit, a control unit, and an auxiliary and safety system. Its main components include the following parts.

a) The test unit consists of components such as the furnace cover, furnace body, furnace heater, radiant heater, and instrument housing. (Structure diagram follows.) See Figure

2.Heaters are embedded in the furnace cover and furnace body, and radiant heaters are installed at the bottom of the furnace cavity to provide uniform heating. Controlled heating. The furnace cavity temperature sensor accuracy should reach ±0.1 °C, and the sample temperature sensor accuracy should reach ±0.1 °C. The pressure sensor accuracy should reach ±1 kPa.

5.2 Calorimeter Pool

5.2.1 The material can be stainless steel, titanium, Hastelloy, or other metals or glass. The shape should be spherical and the volume should not be less than 7 mL.

5.2.2 Based on the installation location of the sample temperature sensor, calorimeters can be divided into those with the sample temperature sensor inserted internally and those with the sample temperature sensor externally connected. There are three types of calorimeters. the sample temperature sensor sleeve embedded, the sample temperature sensor sleeve embedded, and the structural schematic diagram of the calorimeter is shown in Appendix A.

5.2.3 If the calorimeter and its connecting pipes are reused, the calorimeter and any pipes that the sample may come into contact with should be cleaned with solvent after the test. Remove any remaining samples or residue from other parts and keep them clean and dry to prevent cross-contamination and corrosion.

5.3 Balance The balance should have a weighing range of no less than 100 g and an accuracy of ±0.0001 g.

6.1 Calibration

6.1.1 The adiabatic calorimeter should be calibrated before initial use and when there are significant changes to the testing equipment system, such as replacing the temperature sensor or pressure sensor. Force sensors, heaters, furnaces, etc.; should be calibrated regularly according to the testing frequency during use.

6.1.2 If the entire instrument cannot be calibrated, then the calorimeter's calorimeter temperature sensor, furnace temperature sensor, and pressure sensor should be checked. The sensor readings are calibrated to meet the following calibration requirements.

a) The temperature indication error of the calorimeter pool is within the calibration range of 0 °C~350 °C, and the difference between the temperature indication and the actual value shall not exceed ±2 °C;

b) The temperature indication error of the heating furnace, with a calibration range of 0 °C ~ 350 °C, shall not differ from the temperature indication of the sample temperature sensor by more than [amount not specified]. ±3 °C;

c) Temperature rise rate indication error, the calibration range is the temperature rise rate within 20 minutes starting from the moment the calorimeter pool temperature reaches 100 °C, compared with the set value. The difference between the set values shall not exceed ±3%;

d) Pressure indication error, calibration range 0 kPa~15 MPa, the difference between the pressure indication and the actual value of the sealed pipeline connected to the calorimeter.