

ICS 25.030

CCS J 04



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 47564-2026

**Additive manufacturing - Determination of hazardous
substances emitted during the material extrusion process**

增材制造 材料挤出成形打印过程有害物质的测定

Issued on: April 30, 2026

Implemented on: November 1, 2026

**Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC**

Table of Contents

5	Reagents and Materials
6	Instruments and Equipment
6.6	Analytical balance, analytical precision
7	Data Collection and Testing
8	Result Calculation
8.2	Volatile Organic Compounds
8.3	Aldehydes and Ketones
8.4	Precision
9	Test Report

Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part

1. Structure and Drafting Rules of Standardization Documents". Drafting. Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents. This document was proposed by the China Machinery Industry Federation. This document is under the jurisdiction of the National Technical Committee on Standardization of Additive Manufacturing (SAC/TC562). This document was drafted by: Wuxi Inspection and Testing Certification Institute, Jinhua Zaowu New Materials Co., Ltd., and Wuyi Sting Narui 3D Technology. Limited Liability Company, Jiangsu Mingya Technology Co., Ltd., Nanjing Institute of Environmental Sciences, Ministry of Ecology and Environment, Nanjing Normal University, Guoke Testing Technology Service (Shandong) Co., Ltd., Nanjing Customs Textile Industry Product Testing Center, Jiangsu Guoce Testing Technology Co., Ltd., Jiangsu Yice Testing Technology Co., Ltd. Limited Liability Company, Jiangsu Hangpu Guochuang Composite Materials Research Institute Co., Ltd. The main drafters of this document are: Zhang Dongbing, Chen Zuowang, Xu Jie, Han Minfeng, Zhang Jie, Tang Wenlai, Zhou Hao, Zhang Houhu, Li Zhenguang, and Wei Feng. Xiang Housheng, Xu Weichen, Jiang Peng, Gao Shaowu. Additive manufacturing material extrusion printing process Determination of harmful substances

1. Scope This document specifies the principles, reagents, materials, and instruments for testing harmful substances generated during material extrusion molding and printing. Preparation, data collection and testing, result calculation and test report. This document applies to the total suspended particulate matter, volatile organic compounds, and

aldehydes and ketones released during the material extrusion molding and printing process. Determination of harmful substances such as certain substances.

4.Principles The material to be extruded (hereinafter referred to as "printing material") is heated and melted, and the molten material is extruded into a sealed test chamber and subjected to constant temperature. The released hazardous substances were collected after equilibration under certain conditions. Suspended particulate matter in the hazardous substances was adsorbed using a filter membrane, and its content was determined by the gravimetric method. Volatile organic compounds were adsorbed using Tenax-TA adsorption tubes, and their content was determined by thermal desorption-gas chromatography (or mass spectrometry). DNPH adsorption tubes adsorb derived aldehydes and ketones, which are then eluted with acetonitrile and their content is determined by high performance liquid chromatography.

5 Reagents and Materials

5.1 Unless otherwise specified, all reagents are of analytical grade and the water is Class II water as specified in GB/T 6682-2008.

5.2 Helium, with a purity greater than 99.995%.

5.3 Nitrogen gas, with a purity greater than 99.99%.

5.4 Hydrogen gas, with a purity greater than 99.99%.

5.5 Acetonitrile, chromatographic grade.

5.6 Volatile organic compound reference materials, with certified reference materials.

5.7 Aldehyde and ketone standard substances, derived from 2,4-dinitrophenylhydrazine (DNPH), have certified standard substances containing formaldehyde, acetaldehyde, acetone, acrolein, and propionyl ether. Aldehydes, butenal, butanone, butanal, methacrolein, benzaldehyde, pentanal, methylbenzaldehyde, cyclohexanone, hexanal, etc.

5.8 Derivative sampling tubes, with at least 350 mg of 2,4-dinitrophenylhydrazine (DNPH) coated inside.

5.9 Ozone removal column, the tube is filled with not less than 1.0g of potassium iodide (KI).

5.10 Organic filter membrane with a pore size of 0.45 μm .

5.11 Tenax-TA adsorption tube, with no less than 200 mg of Tenax-TA adsorption material inside the tube.

6 Instruments and Equipment

6.1 Test chamber, with a volume of approximately 1 m^3 , whose volume and temperature

should be calibrated. Appendix A provides a schematic diagram of the test chamber.

6.2 Sampler. A high-flow-rate sampler or a medium-flow-rate sampler can be selected. The flow rate should be calibrated and the relative error should be within $\pm 2\%$.

6.3 Constant temperature and humidity equipment (room). The air temperature inside the equipment (room) should be controlled between 15°C and 30°C , with a temperature control accuracy of $\pm 1^{\circ}\text{C}$; the relative humidity should be controlled... The control rate is within the range of $(50\pm 5)\%$.

6.4 The gas chromatograph/gas mass spectrometer shall be equipped with a thermal desorption unit, a flame ionization detector or a mass spectrometer detector, and a DB-5 sensor with a specification of 60m. Capillary column or equivalent separation column.

6.5 The high-performance liquid chromatograph should be equipped with a 100mm x 4.6mm x $2.7\mu\text{m}$ C18 column and an ultraviolet or diode array detector. Measuring device.

6.6 Analytical balance, analytical precision

0.01 mg.

7 Data Collection and Testing

7.1 Preparation of the test chamber Clean the interior surface of the cabin with a non-woven cloth soaked in ethanol or acetone, then blow dry to remove the ethanol or acetone. Collect air from the cleaned cabin for testing. White test. After connecting the printing material to be tested to the melting device, set the melting temperature to the material's stated operating temperature or the stated operating temperature range. Maximum value.

7.2 Sample Preparation The printing material to be tested should be a roll of printing material within its warranty period and free of oil stains on its surface.

7.3 Collection and Testing of Total Suspended Particulate Matter Approximately 10 meters of printing material was heated and melted, causing the resulting suspended particles to be released into the test chamber. After melting, the material was kept at $(30\pm 2)^{\circ}\text{C}$. Balance for 30 minutes. Collect air samples inside the chamber according to HJ1263-2022 to test total suspended particulate matter.

7.4 Collection and Testing of Volatile Organic Compounds The printing material, approximately 1 meter long, was heated and melted, causing the volatile organic compounds generated to be released into the test chamber. After melting, the temperature was within $(30\pm)$ degrees Celsius. 2) Equilibrate at $^{\circ}\text{C}$ for 30 min. Collect air inside the chamber according to Appendix C and Appendix D of GB/T 18883-2022 to test volatile organic compounds. Content of substances (including benzene series compounds).

7.5 Collection and Testing of Aldehydes and Ketones Approximately 1 meter of printing material was heated and melted, causing the resulting aldehydes and ketones to be released into the test chamber. After melting, the material was allowed to equilibrate at $(30\pm 2)^{\circ}\text{C}$. 30 min. Collect air inside the chamber according to the requirements of GB/T 42998-2023 to test the content of aldehydes and ketones.

7.6 Weighing of molten material After completing the hazardous substance collection in steps

7.3 to 7.5, the molten material should be removed and weighed. Gloves should be worn when removing samples, and they should be weighed promptly after removal to reduce the impact of moisture absorption on quality. If immediate weighing is not possible, they should be stored in a cool, dry place. Store in a drying container.

8 Result Calculation

8.1 Total suspended particulate matter The total suspended particulate matter content generated by the melting of printing materials is calculated according to formula (1).

8.2 Volatile Organic Compounds

8.2.1 The content of a single component generated by the melting of printing material is calculated according to formula (2).

8.2.2 The total content of volatile organic compounds generated by the melting of printing materials shall be calculated according to formula (3).

8.3 Aldehydes and Ketones

8.3.1 The content of a single component generated by the melting of printing material is calculated according to formula (4).

8.3.2 The total amount of aldehydes and ketones produced by the melting of printing materials shall be calculated according to formula (5).

8.4 Precision

8.4.1 Repeatability In the same laboratory, by the same operator using the same equipment, following the same testing methods, and within a short period of time, the same test object is subjected to... The tests should be conducted independently, and the relative deviation between the two independent test results should not exceed $\pm 10\%$.

8.4.2 Reproducibility Different laboratories, different operators, using the same equipment, following the same testing methods, and conducting independent tests on the same test subject within a short period of time. The test should be conducted immediately, and the relative deviation between the two independent test results should not exceed $\pm 20\%$.