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

GB/T 47456-2026

Selection requirements for materials in manned spacecraft

载人航天器材料选用要求

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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 is under the jurisdiction of the National Manned Spaceflight Standardization Technical Committee (SAC/TC570). This document was drafted by: Beijing Spacecraft Overall Design Department, China Astronaut Research and Training Center, and Space Application Engineering Institute of the Chinese Academy of Sciences. Engineering and Technology Center, Beijing University of Aeronautics and Astronautics, Southwest Jiaotong University, Beijing Institute of Space Science and Technology Information, Shanghai Aerospace System Engineering Research Institute. The main drafters of this document are. Zhang Lantao, Hou Yongqing, Yu Jin, Jin Jian, Qu Xi, Liu Gang, Guo Dongli, Zhao Jianhe, Gao Yuchen, Han Yan, and Wang Wei. Wang Ran, Yin Yumei, Liu Hong, Zhou Zuowan, Xu Kanyan, Li Xuedong, Xu Chengxin, Li Hongyang. Requirements for Material Selection in Manned Spacecraft

1.Scope This document specifies the selection principles for materials used in manned spacecraft and related equipment, including metallic materials, non-metallic materials, and

prohibited or restricted materials. Selection requirements. This document applies to the selection of materials for manned spacecraft and equipment for space station missions.

3. Terms and Definitions This document does not contain any terms or definitions that need to be defined.

4. Material Selection Principles The principles for material selection are as follows:

- a) The materials meet the product performance requirements;
- b) The material can adapt to both ground-based development and on-orbit space environment conditions;
- c) Prioritize the use of mature materials that have undergone flight testing and meet technical standards;
- d) Select materials that are in a stable phase of their lifespan to ensure reliable functional performance during on-orbit use;
- e) For new materials that have not been flight-tested, conduct material testing based on the conditions of the in-cabin or out-of-cabin operating environment;
- f) For proven materials that have undergone flight testing, their suitability should be reassessed when production conditions or usage environments change;
- g) Restricted materials meet the restriction conditions;
- h) If the above principles are not met, a comprehensive assessment of the usage and impact shall be conducted, and the application shall be selected only after approval.
- i) Select a testing organization with relevant national industry qualifications to conduct material testing according to the required testing methods;

1 Scope

GB/T 47456-2026 is the Chinese national standard covering choosing materials for a crewed vehicle - the flammability in an oxygen-enriched cabin, the outgassing and toxicity of what a sealed atmosphere accumulates, the odour, and the vacuum and radiation behaviour outside. First edition, in force since 1 November 2026, with GB/T 47455-2026 on payload validation. It was issued on 30 April 2026 and takes effect on 1 November 2026, as a first edition. This page is published from the official record of the 2026 edition; the clause text of a standard this recent is not yet in circulation, and the figures, limits and tables it contains are those of the document itself, delivered in full with the English translation.

0 No mold growth or no mold observed Trace amounts of mold growth. Mold growth and reproduction are sparse or limited, covering less than 5% of the total area of the test sample, with little or no substrate utilized or destroyed. Bad. Almost no chemical, physical, or structural changes were detected.

2.Slight mold growth. Mold colonies spread intermittently or are loosely distributed on the substrate surface, with mold growth covering less than 25% of the total area, indicating moderate reproduction.

3.Moderate mold growth. Mold grows and multiplies in large quantities, covering less than 70% of the total area, and the substrate surface exhibits chemical, physical, and structural changes.

4.Extensive mold growth. Mold grows and multiplies rapidly, covering more than 70% of the total area, causing the substrate to decompose or deteriorate rapidly.

2 Odor Rating Classification Level Description 0 I can't feel it 1.I almost felt

2.It was clearly felt

4 Irritating odor

7.4 Anti-static requirements Textiles shall be evaluated for electrostatic properties in accordance with GB/T 12703.2, and the surface charge density shall not exceed 7.0 $\mu\text{C}/\text{m}^2$.

7.5 Flash point and ignition point requirements Plastic materials shall be tested for flash point and ignition point in accordance with GB/T 9343. Testing of other non-metallic materials shall be conducted according to relevant standards. The material should be tested according to the national standard for its type. The flash point and ignition point of the material should not be less than 204°C.

7.6 Requirements for moisture absorption and desiccation Materials absorb moisture during manufacturing and storage. Therefore, it is important to prevent moisture absorption and dampness during storage and processing, especially when the dimensions are stable. When high performance requirements are needed, the dimensions and weight of the material before and after moisture absorption and desorption should be measured to ensure that performance is not affected before proceeding. use.

8 Requirements for the selection of non-metallic materials in unsealed environments

5 General Selection Requirements

5.1 Salt spray protection requirements Salt spray testing of materials should be conducted in accordance with GB/T 10125. The impact on material performance should be assessed after the test to ensure the materials' performance in manned spaceflight. The equipment and products are not subject to salt spray corrosion during storage, transportation, assembly, and testing, or the effects of salt spray corrosion are assessed to be within acceptable limits. Within the enclosure.

5.2 Media compatibility requirements Materials that come into contact with oxygen, fuel, oxidants, circuit working fluids, or other reactive chemicals should be treated according to the actual environmental conditions in which the product is used. Accelerated compatibility testing throughout the product's lifespan confirms the compatibility with gas, liquid, and material properties and chemistry throughout the product's lifespan. The ingredients are unaffected.

5.3 Creep Resistance Requirements For materials prone to creep, assess their creep behavior under operating conditions to ensure that creep does not occur during the product's lifespan. The material properties do not affect the use of the product after creep.

5.4 Lifespan Requirements For materials used in non-replaceable products, critical components, or parts operating in harsh environments, ensure that the materials do not deteriorate due to corrosion or aging. The performance degradation caused by degradation affects the on-orbit lifespan of spacecraft.

6 Requirements for the selection of metallic materials

6.1 General Rules The requirements are as follows:

- a) Metallic materials should comply with the general requirements for physical and mechanical properties related to spacecraft material selection, and a thorough evaluation of the metal's properties should also be conducted. Corrosion resistance, hydrogen embrittlement resistance, and galvanic compatibility of the materials;
- b) Utilize alloying, heat treatment, and coating techniques as much as possible to improve the corrosion resistance of metallic materials;
- c) It should be used according to the lower limit of the strength of metallic materials, and should not be used to the performance limit of the material;
- d) When selecting materials, the strength, plasticity and toughness of the materials should be considered comprehensively, and high-strength and tough materials resistant to delayed fracture should be given priority.

6.2 Corrosion Resistance Requirements The corrosion resistance requirements for the selected metallic materials are as follows:

- a) Stress corrosion sensitivity screening should be conducted according to QJ20410 to select materials with high stress corrosion resistance;
- b) Materials resistant to microbial and acidic corrosion should be preferred.

6.3 Hydrogen embrittlement resistance requirements Hydrogen-sensitive metallic materials exposed to gaseous or liquid hydrogen environments should undergo hydrogen embrittlement sensitivity testing according to HB5067.1. Test and evaluate the impact of hydrogen embrittlement on material properties; only materials that meet design