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Space functional coatings - Plating for eliminating stray light

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part

1. Structure and drafting rules for standardization documents" Drafting. Please note that some of the contents of this document may involve patents. The issuing organization of this document does not assume the responsibility for identifying patents. This document is provided by the National Technical Committee on Aerospace Technology and Its Applications (SAC/TC425), the National Technical Committee on Metal and Non-metal Coverings It is proposed and coordinated by the Standardization Technical Committee (SAC/TC57). This document was drafted by: Beijing Satellite Manufacturing Co., Ltd., China Aerospace Standardization Institute, China Machinery Engineering Academy Group Wuhan Materials Protection Research Institute Co., Ltd., Beijing Xingchi Hengdong Technology Development Co., Ltd., Shanghai Aerospace Equipment Manufacturing Plant Co., Ltd., Chinese Academy of Sciences Shanghai Institute of Silicates, Beijing Institute of Space Mechatronics, Shanghai Institute of Space Control Technology, Institute of Space Materials and Technology, Xi'an Aerospace Engine Co., Ltd., Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences. The main drafters of this document are. Bai Jingying, Wang Jingrun, Ma Qiang, Cheng De, Zhang Jiaqiang, Li Sizhen, Wang Tiantian, Zhang Dezhong, Zhai Yunfei, Xin Shigang, Duan Pengfei, Zhang Ligong, Jiang Mingxia, Du Weifeng, Li Junfeng, Gu Xuhan, Yang Zhazhan, Fan Bo, Wen Chen, Pintuo, Yi Juan, and Yang Xin. Aerospace functional coating layer Stray light elimination coating layer

1 Scope

GB/T 43764-2024 specifies the black coatings applied inside spaceborne optical instruments to suppress stray light. A telescope or star tracker looking at a faint target next

to a bright one lives or dies by what its baffles and inner walls reflect: a coating that scatters a fraction of a percent puts a veil across the image that no processing can remove. The coating must also survive vacuum ultraviolet, atomic oxygen in low orbit, and particle irradiation without whitening, outgassing or shedding particulate onto the optics. The standard sets the technical requirements and test methods, the inspection rules, the marking and accompanying documents, and the packaging, transport and storage provisions, with normative annexes giving the vacuum ultraviolet irradiation test method, the atomic oxygen test method and the space particle irradiation test method. It took effect on 1 July 2024.

This document specifies the technical requirements for the stray light elimination coating obtained on the surface of aerospace optical products by electroplating, chemical plating, vacuum plating, etc. Test methods, inspection rules, identification and accompanying documents, packaging, transportation and storage. This document is applicable to the anti-glare coating (black nickel plating, Inspection and acceptance of black chrome plating, black zinc plating, black copper plating, etc.

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document. For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document.

GB/T 3138 Terminology for surface treatment of metals and other inorganic coatings

GB/T 5270 Review of the test method for adhesion strength of electrodeposited and chemically deposited metal coatings on metal substrates

GB/T 6462 Metal and oxide coating thickness measurement microscope method

GB/T 10988 Measurement method of stray light in optical systems

GB/T 13962 Terminology of optical instruments

GB/T 25968 Test method for measuring solar transmittance and solar absorption of materials using a spectrophotometer

GB/T 34517 Vacuum outgassing evaluation method for non-metallic materials used in spacecraft

GB/T 34522 Spacecraft thermal vacuum test method

3 Terms and definitions

The terms and definitions defined in GB/T 3138, GB/T 10988 and GB/T 13962 apply to this

document.

4 Technical requirements

4.1 Pre-treatment before plating Before surface plating of optical products, oil stains should be removed using solvents such as ethanol or other methods before plating.

4.2 Coating structure The stray light elimination coating is generally composed of a bottom coating and a surface coating, and the requirements are as follows:

- a) The bottom plating layer should be zinc plating, copper plating or nickel plating according to the substrate;
- b) The surface coating should be black nickel plating, black chromium plating, black zinc plating, black copper plating, etc.

4.3 Appearance

4.3.1 Color The coating should be black or gray-black, continuous and uniform.