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Test method for mechanical stability of superhydrophobic surfaces

超疏水表面的力学稳定性测试方法

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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 was proposed by the China Machinery Industry Federation. This document is under the jurisdiction of the National Technical Committee for Standardization of Metallic and Non-metallic Coverings (SAC/TC57). This document was drafted by: University of Electronic Science and Technology of China, Wuhan Institute of Materials Protection Co., Ltd. of China Machinery Engineering Institute Group, Jiangsu Guoqiang Xingsheng Energy Technology Co., Ltd., Midea Group Co., Ltd., Shandong Zhongkai Huarui Engineering Materials Co., Ltd., Guangzhou Jintai Technology Co., Ltd. Company, Anhui Mining Electromechanical Equipment Co., Ltd., University of Electronic Science and Technology of China (Shenzhen) Institute of Advanced Studies, Mianyang Maxwell Technology Co., Ltd. Department of Standardization, Hubei Provincial Institute of Standardization and Quality. The main drafters of this document are. Deng Xu, Wang Dehui, Duan Haitao, Zhang Min, Wang Liying, Wang Ying, Duan Hui, Su Dongyi, Liu Lian, Chen Yanming, Wang Xiangting, Yan Hui, Song Jianing, and Li Huanjing.

Superhydrophobic materials have attracted much attention in many application fields due to their excellent wetting properties and self-cleaning characteristics. Due to the wide application in practical applications, the surface micro/nanostructures face various challenges of damage and failure. External environmental factors, such as collision, Friction, wear, dust, gravel, and rainwater erosion may cause the super-hydrophobic performance to fail. In order to maintain its superior performance in use, accurate and reliable performance testing is essential. In the test, the lack of a complete set of standardized methods leads to uncertainty and incomparability of test results. The effectiveness mechanism of the superhydrophobic material surface is analyzed, and relevant performance test standards and methods are given, in order to provide reliable technology for the research and application of superhydrophobic material surfaces. support. Mechanical stability test method for superhydrophobic surfaces

1 Scope

GB/T 45017-2024 gives the Chinese test method for the mechanical stability of superhydrophobic surfaces. Superhydrophobicity is easy to demonstrate and hard to keep: the effect depends on a fragile micro- and nanoscale texture, and the published water contact angles say nothing about whether the surface survives being touched, wiped, rubbed or rained on, which is the single reason such coatings have failed to reach most of the applications proposed for them. The standard therefore standardises the durability test rather than the effect. It sets the principle, the specimens and their preparation, the apparatus, and the mechanical loading procedures, abrasion under defined load and cycles, tape peel, scratching, sand impact and the other challenges, followed by the measurement of the contact angle and sliding or roll-off angle before and after, the criteria

by which stability is judged and graded, and the reporting. It takes effect on 1 June 2025.

This document specifies the instrumentation, test conditions, test methods, result analysis and test for the mechanical stability test of superhydrophobic surfaces. Report. This document applies to the mechanical stability of super-hydrophobic surfaces of metal, inorganic non-metal and organic polymer substrates other than fabric substrates. Test.

2 Normative references

The contents of the following documents constitute 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 1732 Determination of impact resistance of paint films

GB/T 9278 Temperature and humidity for condition adjustment and testing of coating samples

GB/T 9279.1-2015 Determination of scratch resistance of paints and varnishes Part

3 Terms and definitions

The following terms and definitions apply to this document.

3.1 static contact angle staticcontactangle When the liquid forms droplets on the solid surface and reaches equilibrium, a tangent line is drawn at the gas-liquid interface at the intersection of the gas, liquid and solid phases. The angle between the intersection lines.

Note. As shown in Figure 1.

b) theta >90° Figure