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

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**Carbon materials - Fatigue testing - Axial force-controlled
method**

炭素材料 疲劳试验 轴向力控制方法

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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 be subject to patents. The publisher of this document assumes no responsibility for identifying patents. This document is proposed by the China Iron and Steel Industry Association. This document is under the jurisdiction of the National Steel Standardization Technical Committee (SAC/TC183). This document was drafted by: Sinosteel New Materials Co., Ltd., Institute of Metal Research, Chinese Academy of Sciences, Xi'an Super Code Technology Co., Ltd., Qingdao Hua University Shenzhen International Graduate School, Metallurgical Industry Information Standards Research Institute. The main drafters of this document. Yang Hui, Duan Qiqiang, Xu Hanchun, Wang Xiaoyuan, Cheng Hao, Xu Jianping, Zhao Daming, Wang Xuegang, Zhang Lingyu, and Zhou Xianghai. Axial force control method for fatigue testing of carbon materials

1 Scope

China's national method for axial force-controlled fatigue testing of carbon materials. Graphite and other engineering carbons are brittle, porous and weak in tension, and fatigue in them behaves unlike fatigue in metals: there is no plastic zone at a crack tip and no cyclic hardening, and the damage accumulates as microcracking distributed through the material rather than as a single growing crack. That makes force control the appropriate mode - the specimen's stiffness falls as damage accumulates, and controlling force rather than displacement lets that happen and be measured. The materials matter because of where they are used under cyclic load: graphite electrodes in arc furnaces are loaded and thermally shocked with every charge, carbon brushes and seals cycle continuously, and nuclear graphite in a reactor core is subject to loads that vary through the operating cycle over decades.

This document specifies the principles, instruments and equipment, specimens, test procedures, test results and test results of the axial force control method for fatigue testing of carbon materials. inspection report. This document is applicable to axial

constant-amplitude force-controlled fatigue tests on graphite materials at room temperature, including conditional fatigue limit calculations, equal life diagrams and Stress-life curve acquisition. Other carbon materials can be used as reference.

2 Normative reference documents

The contents of the following documents constitute essential provisions of this document through normative references in the text. Among them, the dated quotations For undated referenced documents, only the version corresponding to that date applies to this document; for undated referenced documents, the latest version (including all amendments) applies to this document.

GB/T 1427 Carbon material sampling method

GB/T 34104 Inspection of loading coaxiality of metal material testing machines

3 Terms and definitions

The following terms and definitions apply to this document.

3.1 maximum stress S_{max} The stress with the largest algebraic value in the stress cycle.

3.2 minimum stress S_{min} The stress with the smallest algebraic value in the stress cycle.

3.3 stress ratio R_s The ratio of the minimum stress to the maximum stress in any single cycle during the fatigue test.

3.4 stress step d_s The difference between adjacent stress levels when tested using the lift method.

3.5 stress cycle The stress changes periodically with time.