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Metallic materials - High strain rate compression test method at elevated temperature

金属材料 高应变速率高温压缩试验方法

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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: General Engineering Research Institute of China Academy of Engineering Physics, Jiangsu University of Science and Technology, China Machinery Testing Equipment Co., Ltd. Company, Shenzhen Wandian Testing Equipment Co., Ltd., Shandong Iron and Steel Co., Ltd., Metallurgical Industry Information Standards Research Institute, Gangyan Nanok Testing Technology Co., Ltd. The main drafters of this document. Chen Junhong, Hu Wenjun, Shen Chaoming, Ma Shuangwei, Wang Zhongzhong, Huang Xing, Dong Li, Gao Yifei, Guo Lingmei, Chen Wei, Wang Hui, Gao Guangzhou, Zhang Fangju, Hou Huining, Yang Huifeng, Li Chaoyang. High strain rate and high temperature compression test method for metallic materials

1 Scope

China's national method for high strain rate compression testing of metals at elevated temperature. It extends the room temperature split Hopkinson bar method to hot specimens, and the combination is what most industrial high-rate deformation actually involves. Forging, rolling, extrusion, high speed machining and ballistic impact all deform

metal fast and hot at the same time, and the two effects work against each other: high strain rate raises the flow stress because dislocations cannot keep up, while temperature lowers it. Which dominates cannot be inferred from separate tests, because the deformation itself generates heat that has no time to escape - the process is adiabatic at these rates, and the resulting temperature rise can soften the material enough to localise the deformation into a shear band. Heating the specimen in a Hopkinson bar without heating the bars is the experimental difficulty the method has to solve.

This document specifies the principles, test equipment, specimens, test procedures, and test data processing of high-temperature compression tests on metallic materials under high strain rates. management, validity assessment of test results and test reports. This document is applicable to the compressive stress-strain curve of metal materials when the temperature is higher than room temperature and the strain rate range is 102s-1~104s-1. Determination of mechanical properties.

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 228.2 Tensile testing of metallic materials Part

3 Terms and definitions

The following terms and definitions as defined in GB/T 10623 and GB/T 34108 apply to this document.

3.1 coldcontacttime When the combined heating method is used, the time interval between the waveguide rod contacting the sample and the stress wave reaching the sample/input rod interface.

4 Symbols

The symbols and their descriptions in Table 1 apply to this document. Table

1 Symbols and descriptions Symbol unit description Separate Hopkinson Pressure Rod a1 mm distance between the center of the strain gauge on the input rod and the specimen/input rod contact surface a2 mm distance between the center of the strain gauge on the output rod and the specimen/output rod contact surface