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Rare earth-based hydrogen storage alloys - Test method for the kinetic properties of hydrogenation

稀土系储氢合金 吸放氢反应动力学性能测试方法

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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 and coordinated by the National Rare Earth Standardization Technical Committee (SAC/TC229). This document was drafted by: Baotou Rare Earth Research Institute, Ordos Institute of Applied Technology, Antai Environmental Engineering Technology Co., Ltd., Zhongrare (Micro Shan) Rare Earth New Materials Co., Ltd., Jiangxi Rare Earth Research Institute of the Chinese Academy of Sciences, Qiandong Rare Earth Group Co., Ltd., Inner Mongolia Rare Earth Hydrogen Storage Alloy Co., Ltd., National Standard (Beijing) Inspection and Certification Co., Ltd., Youyan Engineering Technology Research Institute Co., Ltd., Nonferrous Metal Technology and Economic Research HOME LIMITED. The main drafters of this document. Xu Jin, Wang Li, Zhu Xiaomei, Ji Liqiang, Zhang Wei, Chen Qingjun, Yao Nanhong, Wang Yongguang, Yu Limin, Wang Shumao, Li Baoquan, Liu Zhiping, Wang Wei, Li Jun, Hu Huazhou, Zhang Zimin, Gong Yongxin, Niu Xiaowei, Yan Huizhong, Hao Lei, Wei Zhihong, Song Guanyu, Shen Lihan. Rare earth hydrogen storage alloy Test method for kinetic performance of hydrogen absorption and release reaction Warning

--- Personnel using this document should have practical experience in regular laboratory work. This document does not address all possible safety question. Users should have certain professional knowledge and skills and be fully aware of possible gas leaks, current leaks, fire or other serious consequences.

1 Scope

China's national test method for the hydrogenation kinetics of rare earth hydrogen storage alloys. These alloys - the lanthanum-nickel family and its derivatives - absorb hydrogen into their crystal lattice reversibly, holding more hydrogen per unit volume than liquid hydrogen does, and releasing it on demand with a modest temperature or pressure change. They are

the negative electrode of the nickel metal hydride battery, which is where most of them are used, and they are candidates for solid-state hydrogen storage. The capacity is the property usually quoted; the kinetics are the property that determines whether the material is usable. An alloy that holds a great deal of hydrogen and takes hours to absorb it is useless in a battery that must charge in an hour, and the rate depends on surface condition, particle size and the activation the material has received - none of which appear in a capacity figure.

This document describes the test method for the kinetic properties of the hydrogen absorption/desorption reaction of rare earth hydrogen storage alloys. This document is suitable for using the volume method to test the hydrogen absorption/desorption reaction kinetics of rare earth hydrogen storage alloys. The test temperature range is. 25°C~ 300°C, ambient temperature range 23°C±3°C, test pressure range. 0.001MPa~5MPa. 5MPa~10MPa rare earth hydrogen storage Alloy testing may be carried out with reference to this document.

2 Pure hydrogen, high-purity hydrogen and ultra-pure hydrogen GB/T 4842 Argon

GB/T 4844 Pure helium, high-purity helium and ultra-pure helium

GB/T 6379.2 Accuracy of measurement methods and results (correctness and precision) Part

2.Determination of repeatability of standard measurement methods Basic methods of sex and reproducibility

GB/T 8170 Numerical rounding rules and representation and determination of limit values

3 Terms and definitions

The following terms and definitions apply to this document.

3.1 The hydrogen storage alloy reacts with gaseous hydrogen at a certain temperature and forms metal hydride through phase change.

Note. When a hydrogen storage alloy is hydrogenated at a certain temperature, a solid solution alpha phase is first formed as the hydrogen pressure increases; after the hydrogen solid solution is saturated, metal hydrogenation begins to form. In the physical phase (beta phase), there is a two-phase structure of alpha phase and beta phase. Theoretically, the hydrogen pressure remains unchanged; after the hydrogen absorption process is completed, a beta single phase is formed, and the hydrogen absorption continues, and the pressure The force increases rapidly.

3.2 After the hydrogen storage alloy absorbs hydrogen to form metal hydride, it releases

gaseous hydrogen through phase change at a certain temperature.

Note. Hydrogen release is the reverse reaction process of hydrogen absorption.