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Magnesium-based hydrogen storage alloys for solid-state hydrogen storage

固态储氢用稀土系储氢合金

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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 is required. 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 and coordinated by the National Rare Earth Standardization Technical Committee (SAC/TC 229). This document was drafted by: Antai Environmental Engineering Technology Co., Ltd., Inner Mongolia Xi'ao Ke Hydrogen Storage Alloy Co., Ltd., Baotou Rare Earth Research Institute Institute of Technology, Ordos Institute of Technology, YUYAN Engineering Technology Research Institute Co., Ltd., Antai Technology Co., Ltd., Ruike Rare Earth Metallurgy and National Engineering Research Center for Functional Materials Co., Ltd., Zhongxi (Weishan) Rare Earth New Materials Co., Ltd., Jiangxi Rare Earth Research Institute of the Chinese Academy of Sciences Institute, Guorui Science and Technology Rare Earth Functional Materials (Ganzhou) Co., Ltd. The main drafters of this document are. Ji Liqiang, Wang Li, Wang Yongguang, Zhu Xiaomei, Wang Shumao, Duan Yanan, Xu Jin, Li Jun, Chen Qingjun, Ge Liang, Wu Yuanfang, He Wencheng, Xu Yongyan, and Zeng Huifeng. Rare earth hydrogen storage alloys for solid-state hydrogen storage

1 Scope

China's national standard for magnesium-based hydrogen storage alloys used in solid-state storage. Magnesium hydride holds more hydrogen by weight than any other practical metal hydride - about seven and a half per cent, against under two for the rare earth alloys - and magnesium is cheap and abundant, which makes it the most attractive candidate for storing hydrogen as a solid rather than as a compressed or liquefied gas. Its problem has always been temperature: the hydride is thermodynamically stable, so releasing the hydrogen requires around 300 degrees C, which rules out the low-temperature applications and

imposes a substantial energy cost. Decades of work on catalysts, nanostructuring and alloying have brought that down without eliminating it. Where the temperature is available anyway - alongside an industrial process or a high temperature fuel cell - magnesium storage becomes practical, and it is those applications the standard serves.

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 latest version (including all amendments) applies to this document. In this document.

GB/T 1479.1 Metal powders - Determination of bulk density - Part

GB/T 1480 Metal powders - Determination of particle size by dry sieving

GB/T 8170 Rules for rounding off values and expression and determination of limit values

GB/T 12690.19 Chemical analysis of non-rare earth impurities in rare earth metals and their oxides - Part

3 Terms and Definitions

The following terms and definitions apply to this document.

3.1 solid hydrogen storage Hydrogen is stored in solid materials by utilizing the physical adsorption and chemical adsorption of hydrogen by the materials.

3.2 maximum hydrogen storage capacity The maximum mass fraction of hydrogen absorbed by a unit mass of hydrogen storage alloy under a certain temperature and pressure.

Note. It is also expressed as the maximum amount of hydrogen atoms per 1 mol of hydrogen storage alloy (mol).

19 Determination of arsenic and mercury

GB/T 29918-2023 Test method for pressure-composition isotherm (PCI) of rare earth hydrogen storage alloys

GB 39176 Packaging, labeling, transportation and storage of rare earth products XB/T 622.1 Chemical analysis methods for rare earth hydrogen storage alloys - Part

1.Determination of total rare earth content - Oxalate gravimetric method XB/T 622.2 Chemical analysis methods for rare earth hydrogen storage alloys Part

2.Nickel, lanthanum, cerium, praseodymium, neodymium, samarium, yttrium, cobalt, manganese, Determination of the amount of aluminum, iron, magnesium, zinc and copper

XB/T 622.5 Chemical analysis methods for rare earth hydrogen storage alloys Part

5.Determination of carbon content High frequency combustion infrared absorption method XB/T 622.6 Chemical analysis methods for rare earth hydrogen storage alloys - Part

6.Determination of oxygen content - Pulse heating infrared absorption method XB/T 622.7 Chemical analysis methods for rare earth hydrogen storage alloys - Part