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Proton exchange membrane for hydrogen production via water electrolysis

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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 Technical Committee for Separation Membranes Standardization (SAC/TC 382). This document was drafted by: Shandong Dongyue Future Hydrogen Energy Materials Co., Ltd., Shanghai Yihydrogen Technology Co., Ltd., CSSC (Handan) Perri Hydrogen Energy Technology Co., Ltd., Ningbo Changqi Microfiltration Membrane Technology Co., Ltd., Zibo Metrology Technology Research Institute, Beijing Zhongdian Fengye Technology Development Co., Ltd. Co., Ltd., Guangdong Taiji Power Technology Co., Ltd., Suzhou Kerun New Materials Co., Ltd., Zhejiang Jiaxiang Fluoroplastic Co., Ltd., Zibo High-tech Industrial Development Zone Fine Chemicals and Polymer Materials Research Institute, Shandong Senrong New Materials Co., Ltd., Jinan Sike Testing Technology Co., Ltd. Technology Co., Ltd., Jiangsu Yuanhydrogen New Energy Technology Co., Ltd., Shandong Saikesaisi Hydrogen Energy Co., Ltd., Hangmo Technology Development Group Co., Ltd. Co., Ltd., Shanghai Hancheng Industrial Co., Ltd., Aijiexu Chemical Technology (Shanghai) Co., Ltd., Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Weishi Energy Technology Co., Ltd., Gore (Shenzhen) Co., Ltd., Hongji Chuangneng Technology (Foshan) Co., Ltd., Sunshine Hydrogen Energy Technology Co., Ltd. Shanghai Electric Group Co., Ltd., Fujian Haidefu New Materials Co., Ltd., Liaoning Kejing New Materials Co., Ltd., Tianjin Continental Hydrogen Equipment Co., Ltd., Wharton Technology Co., Ltd., Shandong Membrane Society, Suzhou Ucofa New Materials Technology Co., Ltd., Sichuan Dong Hydrogen Source Technology Co., Ltd., Hunan Longshen Hydrogen Energy Technology Co., Ltd., Beijing Xinyan Chuangneng Technology Co., Ltd., Shanghai Shunhua New Energy System Co., Ltd., Shanghai Plastics Research Institute Co., Ltd., Shanghai Wenjing Energy Technology Co., Ltd., Sichuan Zhongke Xingye High-tech Materials Co., Ltd. Guangdong Cavoro Hydrogen Technology Co., Ltd., Anhui Mingtian Hydrogen Energy Technology Co., Ltd., Ningbo Zhongkeke Innovation Energy Technology Co., Ltd. Jiangsu Guofu Hydrogen

Energy Technology Equipment Co., Ltd., Xi'an Aerospace Huayang Electromechanical Equipment Co., Ltd., Tianfu Yongxing Laboratory, Dezhou Xin Kinetic Tower Power Generation Co., Ltd., Ordos Yongsheng Water Treatment Co., Ltd., Zhejiang Jusheng Fluorine Chemical Co., Ltd., Guizhou Meiling Power Supply Co., Ltd. Co., Ltd., Anhui Masumi New Energy Technology Co., Ltd., Zhongrui Guoneng Technology (Dongguan) Co., Ltd., Shanxi Guorun Energy Storage Technology Co., Ltd., State Power Investment Group Hydrogen Energy Technology Development Co., Ltd., Xi'an Longi Hydrogen Energy Technology Co., Ltd., Hydrogen Energy (Shenzhen) Co., Ltd., Shenzhen General Hydrogen Energy Technology Co., Ltd., Sichuan Dongcai Technology Group Co., Ltd., Suzhou Hydrogen Energy Industry Innovation Center Co., Ltd., Haitian Water China Power Construction Group Co., Ltd., Xiamen Jiarong Technology Co., Ltd., Chongqing Moore Water Treatment Equipment Co., Ltd., Sany Hydrogen Energy Co., Ltd., Nanjing Institute of Technology, Shandong University, North China Electric Power University, Beijing University of Chemical Technology, Shanghai Qianfeng Textile Co., Ltd., Shanghai Hydrogen Era Technology Co., Ltd., Hangzhou Jiangrongdao Environmental Technology Co., Ltd., Jiangsu Tuobang Huachuang Technology Co., Ltd., Shandong Electric Power Construction No.

3 Engineering Co., Ltd., and Dalton Membrane Technology (Shenzhen) Co., Ltd. The main drafters of this document are. Zhang Yongming, Zou Yecheng, Xie Xuyang, Cao Pengfei, Ren Hangxing, Li Zhaohui, Ren Jun, Zhang Chunrong, Ma Dongsheng, Yang Dawei, Hu Quanying, He Nailin, Rong Qingong, Zhang Muqing, Xu Bin, Ding Xiaotao, Wang Hanyi, Yang Ying, Wang Xu, Hao Jinkai, Gong Zhengwei, Wang Zhiyong, Yang Yunsong, Wei Guangke, Yang Min, Meng Xiangqing, Zhang Jianguo, Xu Wei, Jin Yan, Liu Hongyu, Ping Lifeng, He Weidong, Chen Xin, Qi Zhigang, Wang Sen, Shi Lei, Fu Cehuang, Guo Wancai, Yu Ruixing, Pan Yongzhi, Chen Yubin, Wang Chao, Zheng Tuowen, Lei Xianzhang, Zhang Qingzhe, Tang Hao, Ye Huaiying, Liu Jiangtao, Zhang Xian, Chen Xinghong, Meng Qing, Zhou Mingzheng, Sun Xuejing, Fan Jiantao, Yao Keguang, Wang Ming, Pan Zhicheng, Zhu Shuang, Jiang Linyu, Ma Bing, Rao Hongyu, Xu Yijun, Chang Jingcai, Liu Jianguo, Liu Yanan, Hao Minglei, Xu Jianfeng, Wang Daxin, Zhao Huiyu, Dai Zengli, Zhang Zhao, Li Jiexian, Fan Yunshuang, Tang Chun, Yang Haofeng, Tan Aidong, Zheng Tao, Liu Yang, Peng Yumei, and Chen Sisi. Proton exchange membrane for hydrogen production by water electrolysis

1 Scope

GB/T 45332-2025 is the Chinese standard for the proton exchange membrane used in water electrolysis for hydrogen production. The PEM electrolyser is the technology green hydrogen is being built on, and the membrane is both its heart and its main cost and durability risk: it has to conduct protons, keep hydrogen and oxygen apart at pressure, survive a strongly oxidising environment, and do so for tens of thousands of hours. The standard sets the classification and designation, the requirements and the test methods for the properties that decide all of that: thickness and its uniformity, tensile strength and

elongation, dimensional change on hydration, ion exchange capacity, proton conductivity, hydrogen crossover, chemical and mechanical durability, and the appearance and packaging requirements. For an electrolyser maker, a membrane producer or anyone qualifying a supply chain for green hydrogen in China, this is the specification the material is bought against.

This document specifies the classification and marking, technical requirements, test methods, inspection rules and signs of proton exchange membranes used for hydrogen production by water electrolysis. Packaging, transportation and storage. This document applies to the scientific research, production, use and management of proton exchange membranes used in proton exchange membrane water electrolysis hydrogen production systems.

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 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 191 Pictorial markings for packaging, storage and transportation

GB/T 6682-2008 Specifications and test methods for water used in analytical laboratories

GB/T 20042.3-2022 Proton exchange membrane fuel cells Part

3 Terms and definitions

The terms and definitions defined in GB/T 20042.3-2022 and the following apply to this document.

3.1 proton exchange membrane A polymer electrolyte membrane with protons as the conductive charge. [Source: GB/T 20042.1-2017, 2.1.9]

3.2 Proton exchange membrane for hydrogen production via water electrolysis Trolysis In the process of electrolyzing water to produce hydrogen, a solid polymer electrolyte conducts only protons and isolates hydrogen and oxygen in the electrolyzer.

3.3 Swelling rate Under given conditions, the dimensional changes of the film after solution in the transverse, longitudinal and thickness directions relative to the dry film. Note

1.The dimensional changes in the transverse, longitudinal and thickness directions are recorded as TD, MD and Z direction swelling rates, respectively. Note

2.The swelling ratio is expressed as a percentage. [Source: GB/T 20042.3-2022, 3.10, modified]

3.4 Proton conductivity The ability of a membrane to conduct protons is the inverse of its resistivity. Note

1.Proton conductivity is an electrochemical indicator that measures the proton conduction capacity of a membrane, which reflects the ability of protons to migrate within the membrane. Note

2.The unit of proton conductivity is Siemens per centimeter (S/cm). [Source: GB/T 20042.3-2022, 3.1]