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GB/T 42847.2-2023/ IEC 62282-8-102:2019

Energy Storage Systems Using Fuel Cell Modules in Reverse Mode —Part 2: Test Procedures for the Performance of Single Cells and Stacks with Proton Exchange Membranes, Including Reversible Operation

储能系统用可逆模式燃料电池模块
第 2 部分：可逆模式质子交换膜单池与电堆性能测试方法

(IEC 62282-8-102:2019, Fuel cell technologies - Part 8-102: Energy storage systems using fuel cell modules in reverse mode - Test procedures for the performance of single cells and stacks with proton exchange membrane, including reversible operation, IDT)

(English Translation)

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CONTENTS

FOREWORD

This document is drafted in accordance with the rules given in GB/T 1.1-2020 "*Directives for standardization - Part 1: Rules for the structure and drafting of standardizing documents*".

This document is Part 2 of GB/T 42847 "Energy storage systems using fuel cell modules in reverse mode". The following parts of GB/T 42847 have been issued:

— Part 2: Test procedures for the performance of single cells and stacks with proton exchange membranes, including reversible operation;

— Part 3: Test procedures for the performance of energy storage systems.

This document is identical to IEC 62282-8-102:2019, *Fuel cell technologies - Part 8-102: Energy storage systems using fuel cell modules in reverse mode - Test procedures for the performance of single cells and stacks with proton exchange membrane, including reversible operation*.

The following editorial changes have been made to this document to a minimum extent:

— For the convenience of use, the standard name was changed into "Energy Storage Systems Using Fuel Cell Modules in Reverse Mode—Part 2: Test Procedures for The Performance of Single Cells and Stacks with Proton Exchange Membranes, Including Reversible Operation";

— For the convenience of use, the units of some symbols were modified (See 3.2);

— In order to follow the principle of drafting national standards, an introducer was added in front of items "Precision", "Accuracy", and "Uncertainty" (See 5.6).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The organizations issuing this document shall not be held responsible for identifying any or all such patent rights.

This document was proposed by the China Electrical Equipment Industrial Association.

This document was prepared by SAC/TC 342 (National Technical Committee on Fuel Cell and Flow Battery of Standardization Administration of China).

This document was drafted by Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Tongji University, Beijing Normal University, Tsinghua University, Beijing Institute of Electrical Technology and Economics of Machinery Industry, Xinyuan Power Co., Ltd., Wuxi Institute of Inspection, Testing and Certification, Advanced Energy Storage Materials National Engineering Research Center Co., Ltd., Shanghai Jiehydrogen Technology Co., Ltd., Beijing Yihuatong Technology Co., Ltd Beijing Changzheng Tianmin High tech Co., Ltd., Zhejiang Gaocheng Green Energy Technology Co., Ltd., Haizhuo Power (Qingdao) Energy Technology Co., Ltd., Anhui Tomorrow Hydrogen Energy Technology Co., Ltd., China Quality Certification Center, Zhejiang Tianneng Hydrogen Energy Technology Co., Ltd., Edelman Hydrogen Energy Equipment Co., Ltd., and Fujian Yanan Electric Machinery Co., Ltd.

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INTRODUCTION

The energy storage systems in reverse mode can effectively utilize the excess electric energy to facilitate electric power regulation/control and renewable energy utilization. GB/T 42847 places emphasis on the performance test methods for energy storage systems based on electrochemical modules (combining fuel cells with electrolyser, or reversible fuel cells).

GB/T 42847 "Energy Storage Systems Using Fuel Cell Modules in Reverse Mode" aims to establish the performance test methods for energy storage systems using fuel cell modules in reverse mode, and is intended to be composed of three parts:

— Part 1: Test procedures for the performance of solid oxide single cells and stacks, which is intended to give the testing systems, instruments and measuring methods, and test methods to test the performance of solid oxide cells and stacks in fuel cell mode, electrolysis and/or reversible mode.

— Part 2: Test procedures for the performance of single cells and stacks with proton exchange membranes, including reversible operation, which is intended to give the testing systems, instruments and measuring methods, and test methods to test the performance of proton exchange membrane cells and stacks in fuel cell mode, electrolysis and/or reversible mode.

— Part 3: Test procedures for the performance of energy storage systems, which is intended to give the test procedures for the performance of electrical energy storage systems using hydrogen.

Energy Storage Systems Using Fuel Cell Modules in Reverse Mode—Part 2: Test Procedures for the Performance of Single Cells and Stacks with Proton Exchange Membranes, Including Reversible Operation

1 SCOPE

This document specifies the PEM cell/stack assembly units, testing systems, instruments and measuring methods, and test methods to test the performance of PEM cells and stacks in fuel cell mode, electrolysis and/or reversible mode.

2 NORMATIVE REFERENCES

The following normative documents contain provisions which, through normative reference in this text, constitute essential provision of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendment) applies.

IEC 60050-485:2020 International Electrotechnical Vocabulary (IEV) - Part 485: Fuel cell technologies

GB/T 28817-2022 Single cell test methods for polymer electrolyte fuel cell (PEFC) (IEC/TS 62282-7-1: 2017, IDT)

3 TERMS, DEFINITIONS AND SYMBOLS

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-485:2020 and the following apply.

3.1.1 active electrode area

geometric area of the electrode perpendicular to the direction of the current flow

Note: Usually this corresponds to the smaller of the two areas of negative electrode or positive electrode.

[Source: IEC 60050-485:2020, 485-02-08, modified: the term name has been modified, and a note has been added.]

3.1.2 area-specific resistance (ASR)

internal resistivity with respect to the effective active electrode area, including the polarization due to the electrochemical reaction

3.1.3 catalyst

substance that accelerates a reaction without being consumed itself

Note: The catalyst lowers the activation energy of the reaction, allowing for an increase in the reaction rate.

3.1.4 catalyst-coated membrane (CCM)

[in a PEMFC (3.1.24)] polymer membrane whose surfaces are coated with a catalyst layer (3.1.5) to form the reaction zone of the electrode (3.1.8)

Note: See the membrane electrode assembly (MEA) (3.1.17).

[Source: IEC 60050-485:2020, 485-04-03]

3.1.5 catalyst layer

surface porous region adjacent to either side of the membrane containing the catalyst (3.1.3), typically with ionic and electronic conductivity

Note: The catalyst layer comprises the spatial region where the electrochemical reactions can take place.

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