Standards for Flow Batteries

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International Flow Battery Forum, Brussels, Belgium 2022

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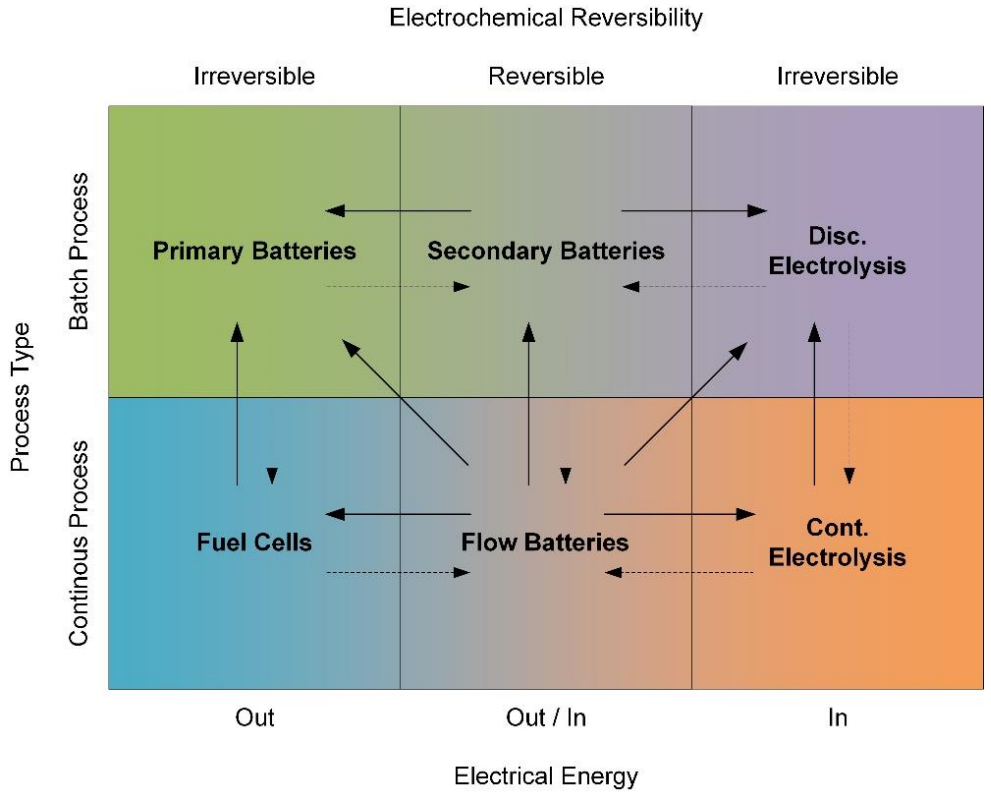
What is a flow battery?



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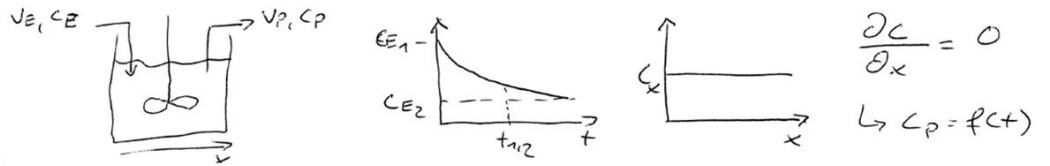
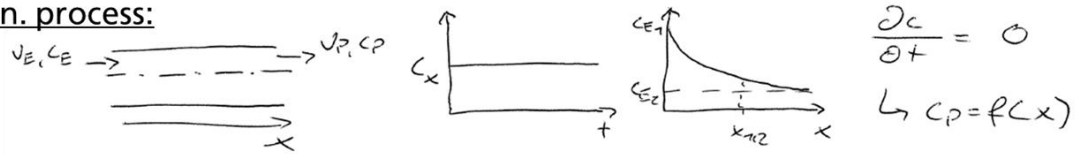


Contin. process:



IEC TC21/TC105 JWG7:

"***„Flow batteries are all electrochemical energy converters that use flowing media as or with active materials and where the electrochemical reactions can be reversed."***

- Fluid-fluid is Flow Batteries
- Solid-fluid is Hybrid Flow Batteries

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Time line

- **2013** CEN CENELEC CWA 50611 "Flow Batteries"Flow batteries – Guidance on the specification, installation and operation"
- International Electrotechnical Commission IEC
  - Technical Committee 21 - Batteries
  - Technical Committee 105 - Fuel Cells
- **2013**? Establishment of Joint Working Group **IEC TC21/TC105 JWG7 "Flow Batteries"** at IEC General Meeting Arlington/USA
- **2013**? Deutsche Kommission Elektrotechnik-Informationstechnik **DKE - AK 371.0.6 "Flow Batteries"**
- **2016 - 2020**
  - **IEC 62932-1**:2020 - Flow battery energy storage systems for stationary applications – Part 1: Terminology and general aspects
  - **IEC 62932-1-1**:2020 - Flow battery energy storage systems for stationary applications – Part 2-1: Performance, general requirements and test methods
  - **IEC 62932-1-2**:2020 - Flow battery energy storage systems for stationary applications – Part 2-2: Safety requirements

IEC Standards

Number	Title
IEC 60050	International electrotechnical Vocabulary (IEV)
IEC 62932-1:2020	Flow battery energy storage systems for stationary applications – Part 1: Terminology and general aspects
IEC 62932-2-1:2020	Flow battery energy storage systems for stationary applications – Part 2-1: Performance, general requirements and test methods
IEC 62932-2-2:2020	Flow battery energy storage systems for stationary applications – Part 2-2: Safety requirements
IEC 61427-1:2013	Secondary cells and batteries for renewable energy storage - General requirements and methods of test - Part 1: Photovoltaic off-grid application
IEC 61427-2:2015	Secondary cells and batteries for renewable energy storage - General requirements and methods of test - Part 2: On-grid applications
IEC 62485-1:2015	Safety requirements for secondary batteries and battery installations - Part 1: General safety information
IEC 62485-2:2010	Safety requirements for secondary batteries and battery installations - Part 2: Stationary batteries
IEC 62933-1:2018	Electrical energy storage (EES) systems - Part 1: Vocabulary
IEC 62933-2-1:2017	Electrical energy storage (EES) systems - Part 2-1: Unit parameters and testing methods - General specification
IEC TS 62933-3-1:2020	Electrical energy storage (EES) systems - Part 3-1: Planning and performance assessment of electrical energy storage systems - General specification
IEC TS 62933-4-1:2017	Electrical energy storage (EES) systems - Part 4-1: Guidance on environmental issues - General specification
IEC TS 62933-5-1:2017	Electrical energy storage (EES) systems - Part 5-1: Safety considerations for grid-integrated EES systems - General specification
IEC 62933-5-2:2020	Electrical energy storage (EES) systems - Part 5-2: Safety requirements for grid-integrated EES systems - Electrochemical-based systems
IEC 60079-10-1	Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres

IEEE Standards

Number	Title
IEEE 2030.2.1-2019	IEEE Guide for Design, Operation, and Maintenance of Battery Energy Storage Systems, both Stationary and Mobile, and Applications Integrated with Electric Power Systems
IEEE 1657-2018	IEEE Recommended Practice for Personnel Qualifications for Installation and Maintenance of Stationary Batteries
IEEE 1679-2020	IEEE Recommended Practice for the Characterization and Evaluation of Emerging Energy Storage Technologies in Stationary Applications
IEEE 1375-1998 (inactive)	IEEE Guide for the Protection of Stationary Battery Systems
IEEE 1578-2018	IEEE Recommended Practice for Stationary Battery Electrolyte Spill Containment and Management
IEEE 1491-2012	IEEE Guide for Selection and Use of Battery Monitoring Equipment in Stationary Applications
IEEE 1660-2018	IEEE Guide for Application and Management of Stationary Batteries Used in Cycling Service
IEEE 1635-2018	IEEE/ASHRAE Guide for the Ventilation and Thermal Management of Batteries for Stationary Applications
IEEE 1881-2016	IEEE Standard Glossary of Stationary Battery Terminology
IEEE 946-2020	IEEE Recommended Practice for the Design of DC Power Systems for Stationary Applications
IEEE 1184-2006	IEEE Guide for Batteries for Uninterruptible Power Supply Systems
IEEE 1547.1-2020	IEEE Standard Conformance Test Procedures for Equipment Interconnecting Distributed Energy Resources with Electric Power Systems and Associated Interfaces

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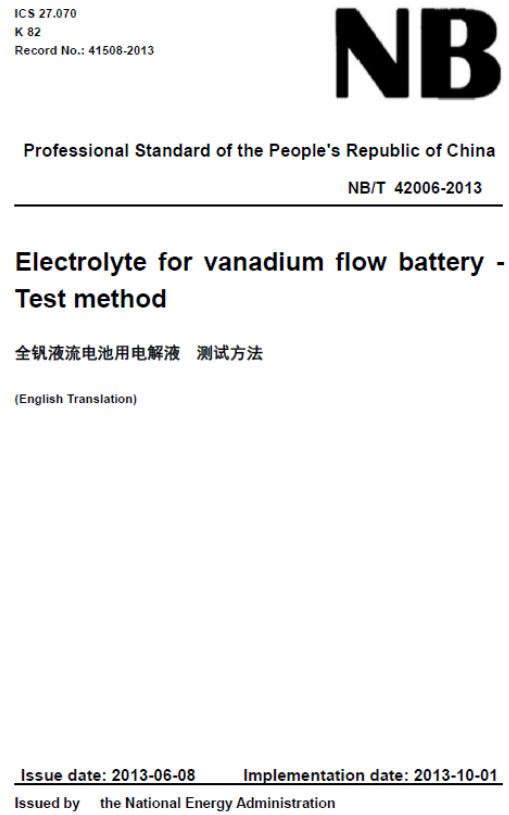
Some other relevant standards

Number	Titel	Remarks
CENELEC CWA 50611:2013	Flow batteries - Guidance on the specification, installation and operation	CENELEC workshop agreement on flow batteries
UL 9540	Standard for Safety - Energy Storage Systems and Equipment	Joint Canadian – United States standard
UL 1973	Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications	
NFPA 855	Standard for the Installation of Stationary Energy Storage Systems	Fire safety standard
ISO 15663:2001	Petroleum, petrochemical and natural gas industries - Life cycle costing	International standard
EU Directive 2006/66/EC	Directive 2006/66/EC of the European Parliament and the council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC	European Commission directive
BattG 2021	German “Gesetz über das Inverkehrbringen, die Rücknahme und die umweltverträgliche Entsorgung von Batterien und Akkumulatoren (Batteriegesetz – BattG)	German national law
UFC 3-520-05	Stationary and Mission Batteries	US-Military standard
UL 9540A	Test method for evaluating thermal runaway fire propagation in battery energy storage systems	
KS C 8547	Redox flow battery for use in energy storage system – Performance and safety tests	Korean standard
PNNL-22010	Protocol for Uniformly Measuring and Expressing the Performance of Energy Storage Systems	
CSA F382:M89	Characterization of Storage Batteries for Photovoltaic Systems	Canadian standard

Chinese national standards

Number	Title
GB/T 29840-2013	Vanadium flow battery - Terminology
GB/T 32509-2016	General specification for vanadium flow battery
GB/T 33339-2016	Vanadium flow battery system - Test method
GB/T 34866-2017	Vanadium flow battery - Safety requirements
GB/T 37204-2018	Electrolyte for Vanadium flow battery
NB/T 42006-2013	Electrolyte for vanadium flow battery - test method
NB/T 42007-2013	Bipolar plate for vanadium flow battery - test method
NB/T 42040-2014	General specification for vanadium flow battery – Abolished 2018!
NB/T 42080-2016	Testing method of ion conducting membrane for vanadium redox flow battery
NB/T 42081-2016	Performance test method for single cell of all - vanadium redox flow battery
NB/T 42082-2016	Test Method for Electrode of Vanadium Redox flow battery



ICS 27.070
K 82
Record No.: 41508-2013

NB

Professional Standard of the People's Republic of China

NB/T 42006-2013

Electrolyte for vanadium flow battery - Test method

全钒液流电池用电解液　测试方法

(English Translation)

Issue date: 2013-06-08　　Implementation date: 2013-10-01

Issued by　the National Energy Administration

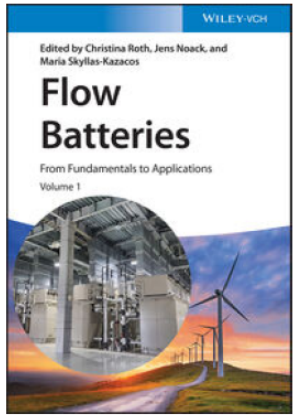
WILEY VCH - Flow Batteries

Information:

- IFBF Website
- WILEY VCH - Flow Batteries: Standards chapter

Participate:

- IEC TC105/TC21 JWG7 https://www.iec.ch/ords/f?p=103:14:213452435543184::::FSP_ORG_ID,FSP_LANG_ID:10887,25
  - See your national commitees, you have to be nominated for JWG7
- Other standardisation bodies



Flow Batteries: From Fundamentals to Applications, 2 Volume Set

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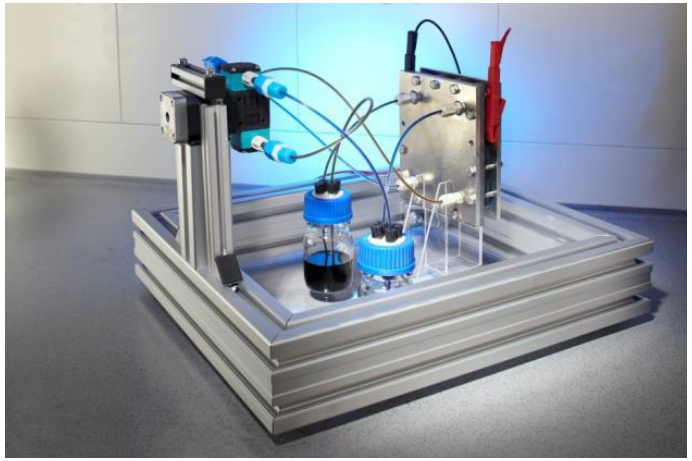
Thank you for your attention!



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