

Characteristics of perfluorosulfonic acid ion exchange in flow batteries



Overview

A series of perfluorosulfonic membranes is screened for application in vanadium redox flow batteries (VRFB): membranes of constant thickness 50 μm with different ion-exchange capacities ranging from 0.

What are the advantages and disadvantages of perfluorosulfonic acid (PFSA) membranes?

Perfluorosulfonic acid (PFSA) membranes are characterized by an optimal combination of these properties. Today, one of the most well-known practical applications of PFSA membranes is the development of fuel cells. Some disadvantages of PFSA membranes, such as low conductivity at low humidity and high temperature limit their application.

Are perfluorosulfonic membranes suitable for vanadium redox flow batteries?

A series of perfluorosulfonic membranes is screened for application in vanadium redox flow batteries (VRFB): membranes of constant thickness 50 μm with different ion-exchange capacities ranging from 0.56 to 1.15 mol eq. g⁻¹.

What are the characteristics of perfluorosulfonic acid polymers (PFSA)?

Membrane materials based on perfluorosulfonic acid polymers (PFSA) possess a set of characteristics necessary for their practical application: high ionic conductivity and selectivity and good chemical stability, strength, and elasticity.

Do perfluorosulfonic acid ionomers have different side-chain lengths?

Perfluorosulfonic acid ionomers (PFSI) with different side-chain lengths have been investigated with respect to their morphology and electrochemical properties in vanadium flow batteries (VFB).

Why do PFSA membranes have low proton conductivities?

Further-more, many pores in the membrane become isolated from each other or their connecting channels turn out to be too narrow; therefore, the proton

conductivities of PFSA membranes in this state are very low and at ~ 2 they are about 1×10^{-5} Ohm $^{-1}$ cm $^{-1}$ at 25°C λ (Fig. 5).

What is a PFSA membrane?

One of the most widely known polymeric ion-exchange membranes is perfluorosulfonic acid (PFSA) polymer membranes due to their unique transport properties and stability. The method of its production was developed in the late 1960s by DuPont. The product has been registered under the brand name Nafion®.

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PFSA NE1000 Series Perfluorosulfonic Acid Ion Exchange Resin

strip flow method. Perfluorinated ionic membrane as the separation of Yin and Yang in all kinds of cell and battery very solid electrolyte, membrane has the property of unidirectional by cation, ...

PFSA Membranes for fuel cells, electrolysis

Perfluorinated ion exchange membrane TPD-M10H is a single component perfluorosulfonic acid H-type ion membrane produced by tape casting. As a ...



Perfluorosulfonic Acid Membranes for Fuel Cells

Advances in electrochemical water conversion and understanding PEMFC degradation drive progress in hydrogen technologies.

CN115632151B

The perfluorosulfonic acid ion exchange membrane prepared by the present invention has high ion selectivity and mechanical strength, and the assembled liquid flow battery has high ...



CE UN38.3 (MSDS)



Commercial perfluorosulfonic acid membranes for vanadium

Apr 1, 2018 · Abstract A series of perfluorosulfonic membranes is screened for application in vanadium redox flow batteries (VRFB): membranes of constant thickness 50 μm with different

...

Nafion Membranes-- The Right Choice for Your Flow ...

Jun 18, 2024 · Solutions for the Energy Industry Powered by Chemours Science Nafion™ perfluorosulfonic acid (PFSA) polymer was invented by Chemours, formerly DuPont, in the ...



STRUCTURE-TRANSPORT RELATIONSHIP OF PERFLUOROSULFONIC-ACID ...

Dec 1, 2016 · Perfluorosulfonic acid (PFSA) ionomers are widely used as an



ion-conducting electrolyte in electrochemical energy devices, such as polymer-electrolyte fuel cells (PEFCs) ...

Commercial perfluorosulfonic acid membranes for vanadium redox flow

Apr 15, 2018 · The on-going commercialization of flow batteries is opening new business niches for component producers including ion-exchange membranes. Membrane cost still represents ...



Enhanced Proton-Selective Hybrid

...

May 6, 2025 · This study introduces a hybrid cation exchange membrane developed by in situ modification of a commercial perfluorosulfonic acid ...

Ion selective membrane for redox flow battery, what's next?

Sep 1, 2023 · Herein, we discuss the developments and challenges of ion

selective membranes, including ion exchange membrane and ion-conducting porous membrane, for redox flow ...



Tuning Polybenzimidazole-Derived Crosslinked ...

Jul 31, 2023 · Non-fluorinated ion exchange membranes with high proton selectivity and conductivity are sought as separators for vanadium redox flow batteries (VRFB) to substitute ...

Preparation and properties of amphoteric ion exchange membrane for ...

Sep 1, 2019 · Therefore, the most important characteristic of the membrane is high ion conductivity through the membrane to complete the redox circuit and high selectivity to prevent ...



New directions in perfluoroalkyl sulfonic acid-based proton-exchange

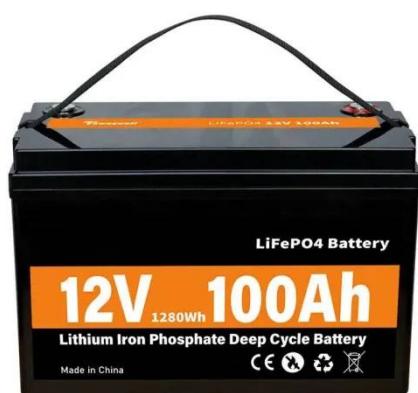
Dec 1, 2019 · Perfluoroalkyl sulfonic acid



(PFSA) polymer membranes have enabled a variety of electrochemical energy storage and conversion devices such as fuel cells and flow batteries ...

Preparation and performance of UIO-66-NH₂ enhanced proton exchange

May 21, 2024 · For proton exchange membranes (PEM) used in vanadium redox batteries (VRBs), doping metal-organic framework (MOF) materials to enhance the proton permeability ...



The ion and water transport properties of K⁺ and Na⁺ form

Aug 20, 2018 · Introduction Ion exchange membranes are in use in a range of situations in which they are exposed to solutions of electrolytes, sometimes quite concentrated solutions.

...

The characteristics and applications of Nafion ...

May 29, 2025 · This architecture enables efficient proton transport when

hydrated, as the sulfonic groups attract and retain water, forming ionic pathways that facilitate proton conduction. Nafion

...



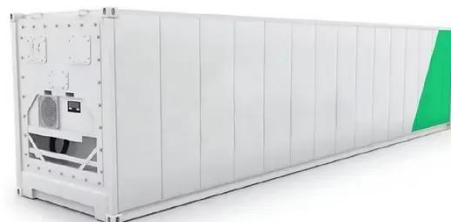
Long-term performance of hydrogen-bromine ...

Abstract Sulfonated poly (ether ketone) (SPEEK), perfluorosulfonic acid (PFSA), and polyvinylidene fluoride (PVDF) were wire-electrospun. Subsequently, ...

High Quality Ion Exchange Membrane, perfluorosulfonic acid ...

Apr 19, 2025 · The PFSA membranes SY11P (N-11) are non-reinforced films based on PFSA polymer, a perfluorosulfonic acid in the acid (H⁺) form. Our PFSA membranes perform as a

...



Perfluorosulfonic Acid Ion Exchange Membrane Market 2025 ...

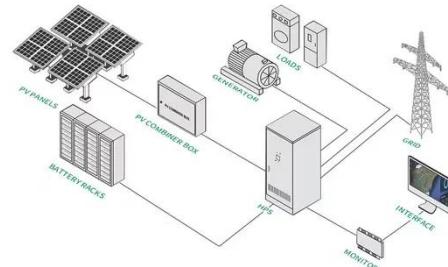
May 12, 2025 · The global Perfluorosulfonic Acid (PFSA) Ion Exchange Membrane market is poised



for significant growth between 2025 and 2032, projecting a Compound Annual Growth ...

Investigations of Dongyue Series Perfluorosulfonic Acid ...

Jul 20, 2025 · This study systematically investigated the physicochemical properties and proton exchange membrane fuel cell (PEMFC) performance of perfluorosulfonic acid (PFSA) ...



Approaches to the Modification of ...

Modification of the intrapore space of the membrane was shown to be a way of targeting the key functional properties of the membranes. Keywords: ...

Unlocking ion selectivity and stability in ion exchange ...

Aug 1, 2025 · For optimal VFB performance, the ion exchange membrane must exhibit high proton

conductivity, low vanadium ion permeability, and excellent chemical and mechanical ...



Commercial perfluorosulfonic acid membranes for vanadium redox flow

Feb 1, 2018 · A series of perfluorosulfonic membranes is screened for application in vanadium redox flow batteries (VRFB): membranes of constant thickness 50 μm with different ion ...

Characterization and process-structure-properties modeling of ion

Apr 1, 2025 · Ion exchange membranes (IEMs) play a critical role in aqueous organic redox flow batteries (AORFBs). Traditional IEMs that feature microphase-separated microstructures are ...



SPEEK-co-PEK-x proton exchange membranes with

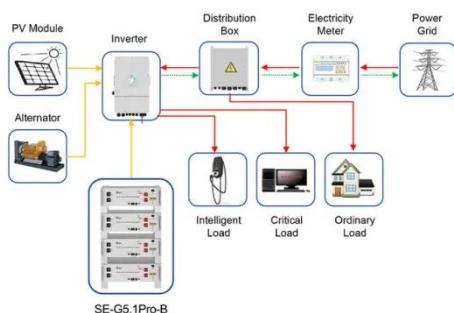
Jan 2, 2024 · Currently, the most widely



used PEM is made of perfluorosulfonic acid (PFSA) materials, such as Nafion or Flemion [[5], [6], [7], [8]]. It consists of a hydrophobic perfluoro ...

Perfluorosulfonic Acid Polymer Membranes: Microstructure ...

Dec 1, 2023 · Ion-exchange membranes based on perfluorinated polymers find application in energy generation and accumulation systems, in particular, fuel cells (FC), electrolyzers, redox ...



Application scenarios of energy storage battery products

Maximizing flow battery membrane performance via pseudo ...

Jan 1, 2025 · Perfluorosulfonic acid membranes, exemplified by DuPont's Nafion, stand as the earliest and most extensively used ion-conducting membranes in VRFB applications [20]. ...

Enhanced Proton-Selective Hybrid

...

May 6, 2025 · Proton-selective membranes present a promising solution for improving the efficiency and sustainability of acid recovery in the ...



Membrane contamination-driven sulfonate structuring for ...

May 1, 2025 · In addition to the perfluorosulfonic acid ion exchange membrane (Nafion), the non-fluorinated cation exchange membrane sPEEK, due to its excellent alkaline stability, is ...

Approaches to the Modification of ...

Abstract Polymer ion-exchange membranes are featured in a variety of modern technologies including separation, concentration and purification of gases and ...



Effect of the Nature of Counterion on Properties of Perfluorosulfonic

Oct 1, 2023 · Abstract The paper presents the results of a study of water uptake, ionic conductivity, and Donnan potential in systems with

perfluorosulfonic acid membranes in the

...



Structure, Characteristics and Ion Selectivity of Perfluorosulfonic

In particular, one of the most critical components in all-vanadium redox flow batteries, proton exchange membrane fuel cells and ion membrane chlor-alkali process devices is the ...



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