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Size effect realizes flow battery

Overview

Are organic reactants the future of redox flow batteries?

Organic reactants are promising candidates for long-lifetime redox flow batteries, and synthetic chemistry unlocks a wide design space for new molecules.

Why are VRFBs the most developed flow battery technology?

Despite problematic vanadium crossover rates, VRFBs are the most developed flow battery technology, in part because crossover may be recovered by remixing and rebalancing electrolytes. This crossover recovery option is possible because positive and negative electrolytes both use vanadium as the redox reactant.

How does electrode area affect a flow battery system?

Although increasing electrode area does not necessarily lead to a lower unit material cost (measured in $/kW or $/kWh), the large-scale, especially MW-scale, flow battery system can usually benefit from cell's large active area (i.e., electrode area), due to that a large cell can reduce the required number of cells and thus assembling difficulties.

Why is crossover recovery possible in redox flow batteries?

This crossover recovery option is possible because positive and negative electrolytes both use vanadium as the redox reactant. Crossover in redox flow batteries occurs by a combination of diffusion, migration, and (electro)-osmosis transport mechanisms, which have been characterized in the greatest detail for the all-vanadium chemistry.

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A high-capacity-density (635.1 mAh g^{-1}) aqueous flow battery with ultrafast charging (

Organic and metalorganic reactants have become promising for long-lifetime flow batteries. Synthetic chemistry unlocks a wide design space to tailor reactant redox potential, solubility, ...

The present study investigates the interdigitated flow field design for a large-scale (900 cm 2 active area) vanadium redox flow battery cell, based on a three-dimensional, multi ...

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Size and Charge Effects on Crossover of Flow Battery Reactants Evaluated by Quinone Permeabilities Through Nafion Publication information: Thomas Y. George, Emily F. ...

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To that end, this work contributes a systematic evaluation of size- and charge-based effects on small molecule permeability through Nafion. These results inform the design of flow ...

Non-aqueous organic redox flow batteries (NAORFBs) suffer from rapid capacity fading mainly due to the crossover of redox-active species across the membrane. Minimizing ...

Here, a 3D computational fluid dynamics model of a flow battery flow field and electrode is used to analyze the implications of increasing flow rates to high power density ...

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