

## ContainerPower Energy Solutions

# Thermal flow battery



## Overview

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Compared with other electrochemical devices such as the temperature-variation based thermally regenerative electrochemical cycle and temperature-difference based thermogalvanic cells, the thermally regenerative electrochemically cycled flow battery (TREC-FB) has the advantages of providing a continuous power output, decoupling the heat source and heat sink, and recuperating heat, and compatible with stacking for scaling up. Are thermally regenerative flow batteries effective?

Thermally regenerative flow batteries are promising for harvesting the ubiquitous low-grade heat energy. Efforts have been made to improve the performance of this type of battery by focusing mainly on thermodynamics perspectives, but ignoring the mass transfer and electrochemical kinetics of the battery.

Is a flow battery energy storage system suitable for large-scale energy storage?

The flow battery energy storage system is well-suited for large-scale energy storage, offering the benefits of long cycle life and the decoupling of power and energy, but the energy efficiency remains to be improved.

What is the working temperature of a flow battery?

In the simulation analysis,  $T_{ref} = 25\text{ }^{\circ}\text{C}$ ,  $Q = 60\text{ mL min}^{-1}$ ,  $I = 40\text{ mA cm}^{-2}$ , and the working temperature is  $40\text{ }^{\circ}\text{C}$ . For charging mode with  $\text{SOC} = 50\%$ , the temperature of the flow battery does not change significantly with boosting the molar concentrations of electrolyte.

What are thermally regenerative batteries?

Thermally regenerative batteries (TRBs) is an emerging platform for extracting electrical energy from low-grade waste heat ( $T < 130\text{ }^{\circ}\text{C}$ ). TRBs using an ammonia-copper redox couple can store waste-heat energy in a chemical form that can be later discharged to electrical energy upon demand.

Are thermally regenerative batteries suitable for closed loop operation?

Thermally regenerative ammonia-based batteries and ACN-based batteries have been shown to be capable of producing significant power densities (about  $10 \text{ mW cm}^{-2}$ ), but the incomplete and intermittent thermal regeneration processes make it hard for closed loop operation and restrain their application [ , , , ].

How does temperature affect a flow battery?

The temperature of the flow battery increases by changing the working temperature from 10 to 40 °C. It may be due to the fact that an increase in working temperature has a considerable effect on the electrochemical activity, charge, and mass transport of the electrolyte .

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