Liquid vanadium battery system cooling patent

What is a liquid cooled battery system?
Immersedliquid-cooled battery system that provides higher cooling efficiency and simplifies battery manufacturing compared to conventional liquid cooling methods. The system involves enclosing multiple battery cells in a sealed box and immersing them directly in a cooling medium.

What is an immersion cooling system for lithium ion batteries?
An immersion cooling system for lithium-ion battery packs that uses glycol-based coolant and a sealed case to cool the batteries uniformly and efficiently. The battery pack has cells held by cell holders inside a sealed case filled with coolant. The coolant surrounds the cells and circulates to extract heat.

What is liquid cooled battery thermal management system (BTMS)?
Liquid-cooled battery thermal management system (BTMS) is of great significance to improve the safety and efficiency of electric vehicles. However,the temperature gradient of the coolant along the flow direction has been an obstacle to improve the thermal uniformity of the cell.

What is the temperature distribution between a battery and a cooling plate?
Temperature distribution of the contact surface between the battery and the cooling plate. Fig. 11 (a) (b) illustrate the temperature variation of the coolant flow direction (X-axis) at the end of discharge. It can be observed that the temperature rise of the coolant increases at the groove end.

What is a boiling-cooling TMS for a lithium iron phosphate battery?
Wu et al. proposed and experimentally demonstrated a boiling-cooling TMS for a large 20 Ah lithium iron phosphate LIBs using NOVEC 7000as the coolant. This cooling system is capable of controlling the T max of the battery surface within 36 °C at a discharge rate of 4C.

How to improve the temperature uniformity of a battery?
By designing grooves of different geometric sizes on both sides of the coolant channel,the heat transfer path between the battery and the coolant is changed,and the temperature of the battery surface at the inlet of the coolant is increased to improve the temperature uniformity of the battery. Fig. 1.

Several other redox flow battery systems have been evaluated for use in large-scale energy storage applications. For example, U.S. Patent 4,786,567, entitled "All- Vanadium Redox Battery," discloses the stability of four oxidation states of vanadium in acid solution, with the following electrodes comprising the soluble active redox species:

The battery thermal management system includes a battery pack, a circulation subsystem, and a heat exchanger. The system can optionally include a cooling system, a ...

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This article will discuss several types of methods of battery thermal management system, one of which is direct or immersion liquid cooling. In this method, the ...

By selectively cooling the batteries of the battery system, the current flow through the battery system can be balanced. Balanced current flow increases battery life and vehicle performance. SUMMARY. Embodiments of the present disclosure relate to, among others, systems and methods for cooling the battery system of electric vehicles ...

Moreover, Angani et al. [88] employed Zig-Zag plates to increase the cooling area within the battery and combined these plates with two different cooling systems - a base plate cooling system and a hybrid parallel piping system. The experimental results revealed that at a discharge rate of 1.25C, the hybrid parallel piping system maintained a lower maximum ...

This article will discuss several types of methods of battery thermal management system, one of which is direct or immersion liquid cooling. In this method, the battery can make direct contact with the fluid as its cooling.

Battery thermal management system for electric vehicles using immersion cooling to efficiently cool the batteries and prevent overheating. The system involves submerging the batteries in a non-conductive liquid, circulating the liquid to extract heat, and using an external heat exchanger to further dissipate it. This provides a closed loop ...

Liquid cooling BTMS, with higher specific heat capacity and thermal conductivity, provides three times the heat dissipation performance of air-cooled battery modules and offers more precise temperature control than air cooling.

A redox flow battery having a high electromotive force and capable of suppressing generation of a precipitation is provided. In a redox flow battery 100, a positive electrode electrolyte and a negative electrode electrolyte are supplied to a battery cell including a positive electrode 104, a negative electrode 105, and a membrane 101 interposed between the electrodes 104 and ...

The liquid-cooled thermal management system based on a flat heat pipe has a good thermal management effect on a single battery pack, and this article further applies it to a power battery system to verify the thermal management effect. The effects of different discharge rates, different coolant flow rates, and different coolant inlet temperatures on the temperature ...

A liquid cooling system includes a cooler (which may also be referred to as a cooling block or water block) that is disposed on or near an electrical component, such as a ...

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The cooling plate is an important guarantee for the performance of liquid-cooling thermal management systems. Huo ... Channel parameters for the temperature distribution of a battery thermal management system with liquid cooling. Appl. Therm. Eng., 186 (2021), p. 8. View PDF View article View in Scopus Google Scholar [17] Y. Huang, P. Mei, Y. Lu, R. Huang, X. ...

The utility model relates to an all vanadium redox flow battery"s thermal management system, wherein the alternative break-make of vanadium liquid stream is connected in the reactor,...

Abstract. An effective battery thermal management system (BTMS) is necessary to quickly release the heat generated by power batteries under a high discharge rate and ensure the safe operation of electric vehicles. Inspired by the biomimetic structure in nature, a novel liquid cooling BTMS with a cooling plate based on biomimetic fractal structure was ...

By selectively cooling the batteries of the battery system, the current flow through the battery system can be balanced. Balanced current flow increases battery life and ...

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