

High temperature liquid metal energy storage

Can liquid metals be used as heat transfer fluids in thermal energy storage?

The use of liquid metals as heat transfer fluids in thermal energy storage systems enables high heat transfer rates and a large operating temperature range (100 °C to >700 °C, depending on the liquid metal). Hence, different heat storage solutions have been proposed in the literature, which are summarized in this perspective.

What are liquid metal thermal energy storage systems?

Liquid metal thermal energy storage systems are capable of storing heat with a wide temperature range and have, thus, been investigated for liquid metal-based CSP systems [3,4] and in the recent past also been proposed for industrial processes with high temperature process heat. [5]

What is high-temperature heat storage with liquid metals?

High-temperature heat storage with liquid metals can contribute to provide reliable industrial process heat >500 °C from renewable (excess) electricity via power-to-heat processes. Liquid metals can also be used to efficiently transport high-temperature waste heat from high-temperature industrial processes to a heat storage medium for later use.

Can liquid metal be used as a heat storage medium?

The perspective is focused on thermal energy storage systems using liquid metal as heat transfer fluids, but not necessarily as heat storage medium. For the latter, the interested reader is referred to several reviews available on latent heat storage systems using liquid metal as a phase change material. [6,7]

Which liquid metals can be used in thermal energy storage systems?

Based on their liquid temperature range, their material costs and thermophysical data, Na, LBE, Pb, and Sn are the most promising liquid metals for the use in thermal energy storage systems and evaluations in section 4 will focus on these four metals.

Can a liquid-metal heat storage system store 100 kilowatt-hours of heat?

The system at KIT is designed to store 100 kilowatt-hours of heat and has been tested on the laboratory scale at temperatures of up to 400 °C so far. "This is the world's liquid-metal heat storage system of this kind with such a capacity. We want to show that the principle works and that it has great potential," says Klarissa Niedermeier.

With growing concerns for climate change, efficient and reliable energy storage technologies are urgently required to realize stable renewable generation into the grid [1], [2], ...

Demand for high temperature storage is on a high rise, particularly with the advancement of circular economy

as a solution to reduce global warming effects. Thermal ...

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This minireview offers an overview of the latest developments in the use of liquid metals for renewable fuel synthesis. Additionally, their use in batteries such as LIBs and Li-S ...

With an intrinsic dendrite-free feature, high rate capability, facile cell fabrication and use of earth-abundance materials, liquid metal batteries (LMBs) are regarded as a ...

Researchers of Karlsruhe Institute of Technology (KIT) are working on the only high-temperature heat storage system based on liquid-metal technology of this kind in order to ...

A room-temperature liquid metal battery with a solid lithium anode electrode and gallium-tin (Ga-Sn) alloy cathode electrode is reported. The Li?Ga-Sn battery has fast reaction kinetics, a ...

At KIT the focus is placed on high-temperature TES using liquid metals as advanced heat transport fluids. ... Theoretical and experimental studies of dual-media thermal energy storage ...

The search for alternatives to traditional Li-ion batteries is a continuous quest for the chemistry and materials science communities. One representative group is the family of rechargeable liquid metal batteries, which ...

These applications all involve high heat flux density or high temperature; therefore, liquid metal convection has advantages in applicability and capability compared with ...

Heat transfer based on molten metal (so-called liquid metals) in heat storage systems is studied by the Karlsruhe Liquid Metal Laboratory (KALLA). Liquid metals allow for the storage of heat ...

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