# Flow and thermal modeling of liquid metal in expanded microchannel heat sinks

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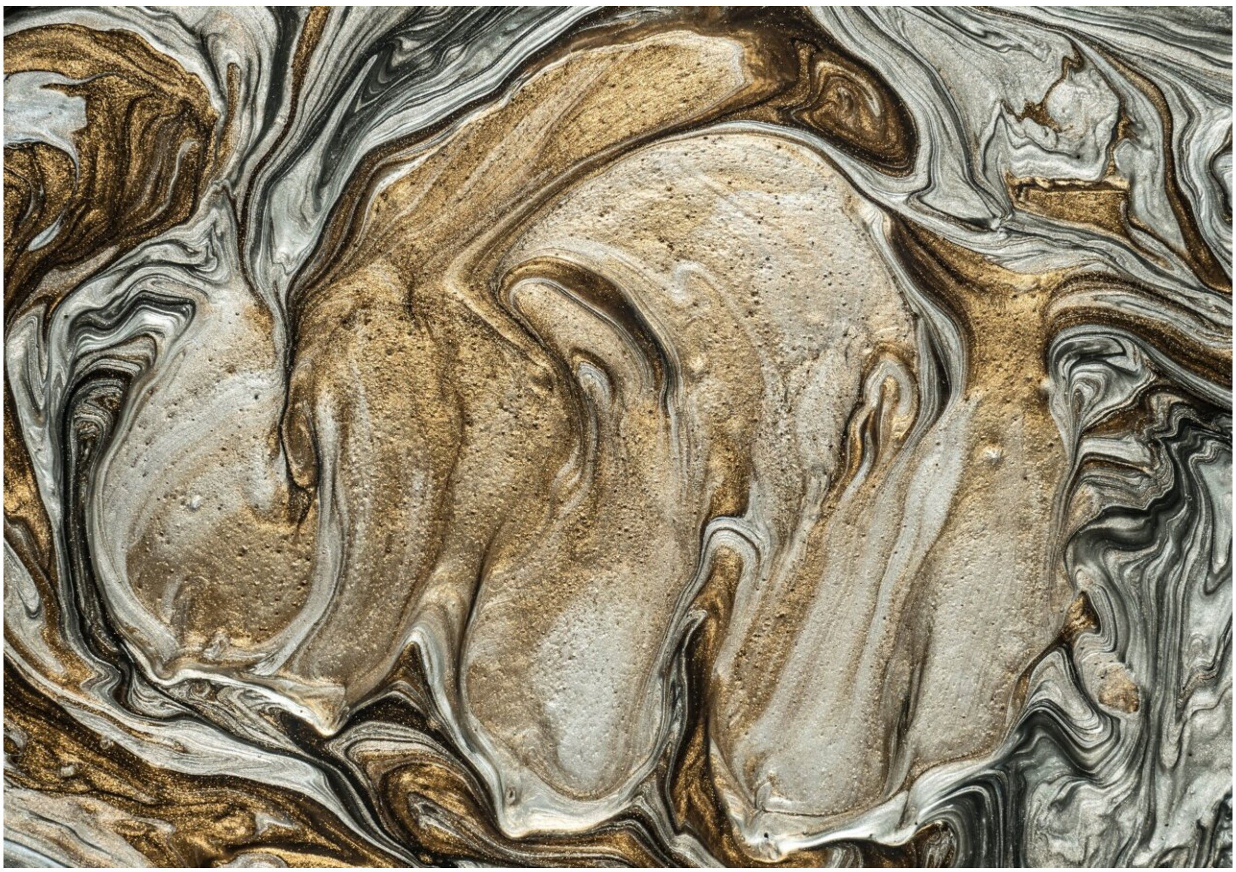

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Liquid metal, with its superior thermal conductivity, has been utilized as a novel coolant in microchannel heat sinks (MCHS). However, liquid metal-based MCHSs suffer from the low heat capacity of coolant, resulting in an excessive temperature rise of coolant and heat sink when dealing with high-power heat dissipation.

Recently, a research team led by Prof. Weil Rao from Technical Institute of Physics and Chemistry, CAS found that the convection at the end of the fins is not significant for heat transfer enhancement. By cutting the fin ends and thus reserving expanded space to increase the flow rate of coolant in the fixed size, the heat transfer will be much more effective.

This expanded microchannel heat sink (E-MCHS) allows more cooling medium to flow through without changing the size of the heat sink, increasing the difficulty of processing, and destroying the stability of the heat sink. This study, titled "Flow and thermal modeling of liquid metal in expanded microchannel heat sink," has been published in *Frontiers in Energy*.

In this study, the flow and thermal performance of liquid metal in E-MCHS have been investigated by using numerical simulation and the 1D thermal resistance model. Compared to MCHSs, E-MCHSs provide expanded space for coolant by truncating the fins or raising the cover plate, and the expanded space at the top of fins could distribute the heat inside microchannels, reducing the temperature rise of coolant and heat sink.

The heat conduction of liquid metal in the Z direction and the heat convection between the top surface of fins and the liquid metal can lead to a maximum reduction of 36% in total thermal resistance. The above process was effective for microchannels with low channel aspect ratio, low mean velocity or long heat sink length.

**More information:** Mingkuan Zhang et al, Flow and thermal modeling of liquid metal in expanded microchannel heat sink, *Frontiers in Energy* (2023). [DOI: 10.1007/s11708-023-0877-5](https://doi.org/10.1007/s11708-023-0877-5)

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