Direct On-Chip Cooling of High-Power AI Chips Using Liquid Jet and Spray Technologies

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Wednesday, February 5th @ 2:00 pm in BRK 1001
Coffee and snacks served before seminar
also on MS Teams (link in email)

Abstract:

The increasing heat flux densities and compact architectures of high-power GPUs, driven by advancements in semiconductor technology and advanced packaging, present significant thermal management challenges. With thermal design power reaching 1000W (NVIDIA's B200 chip), efficient heat dissipation is essential to prevent performance degradation, thermal runaway, and reduced device lifespan. Among active cooling techniques, liquid jet and spray cooling are emerging as promising solutions for data center thermal management. To eliminate the thermal resistance introduced by various interface materials, direct on-chip cooling is increasingly favored. This presentation will explore the conceptual design of an innovative chip-level direct two-phase impingement jet cooling system, highlighting recent advancements in achieving efficient phase separation. Additionally, we will discuss the potential of compact, lid-compatible multi-jet impingement manifolds and spray cooling solutions, emphasizing their applicability for high-power applications.

Bio:

Gopinath Sahu is a Postdoc Research Associate at Cooling Technology Research Center (CTRC) and Semiconductor Packaging (S-PACK) lab at School of Mechanical Engineering, Purdue University. He received Master and PhD in Mechanical engineering from Indian Institute of Technology Kanpur, India in 2016 and 2022, respectively. His doctoral research focused on investigation of liquid jet and spray impingement heat transfer for high heat flux devices over different surface textures. Currently, he holds 2 provisional patents related to direct on-chip cooling utilizing multi-liquid jet impingement and has authored 7 journal papers on liquid jet and spray cooling.

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