

2022 - 2023 Colloquium Series

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Leveraging transport principles in hydrogels and boiling heat transfer

We often understand the world through fixed thermodynamic states (e.g., the glass is full versus empty, or the temperature is hot vs cold) rather than through dynamic behaviors (e.g., the glass is leaking, or the temperature is changing). Broadly speaking, I try to see how understanding these dynamic, transport-limited behaviors can be leveraged in some way to augment existing technologies or help us develop completely new technologies. In this talk, I will discuss two ongoing projects. The first is water transport through hydrogels, which is a phenomenon that resembles many flows in biological tissues, biomedical devices, and even water harvesting devices. I will describe how poroelastic diffusion controls water movement in polymeric gels from the meshing of polymer strands and how it could be modified for fast-transport applications. The second project is boiling heat transfer where surfactants can be added to augment heat transfer performance. Our recent work breaks conventional wisdom on the role surfactants play on enhancement as I will explain how diffusion-limited transport of surfactants dictates this enhancement. Both of these projects demonstrate the importance of understanding and even controlling key diffusion transport phenomena.

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WCH 205/206

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Dr. Jeremy Cho is an Assistant Professor of Mechanical Engineering at the University of Nevada, Las Vegas (UNLV). Previously, he was a postdoctoral research associate at Princeton University in the Chemical and Biological Engineering Department where he studied soft matter systems. He received his PhD and SM in mechanical engineering from MIT. His doctoral research is in the area of phase-change heat transfer and interfacial phenomena. He received his BSE in mechanical engineering from the University of Michigan. Dr. Cho heads the Da Kine Lab at UNLV, pursuing research interests in liquid-vapor phase-change phenomena, interfacial and wetting phenomena, surfactant chemistry, and polymer physics.