



SEMINAR

APPLIED MATHEMATICS AND MECHANICS

FS1014

16 September 2025

A DCAMM seminar No. 790 will be presented by

Professor Duckjong Kim
School of Mechanical Engineering,
Gyeongsang National University, South Korea

The title of the lecture is

Engineering Porous Architectures for Advanced Thermal Management

Abstract:

Porous architectures offer versatile platforms for manipulating thermal and mass transport, making them central to advanced thermal management technologies. This seminar presents our recent progress in developing such architectures for two major application domains: **heat transfer control** and **adsorption-based thermal energy management**.

In the field of heat transfer control, we demonstrate how structural design of porous aerogels can enable dynamic conduction tuning, enhanced forced convection, and effective radiative cooling. Key results include a compression-driven thermal switch achieving a nearly 27-fold change in conductivity, aerogels that deliver superior heat transfer performance compared to conventional metal foams, and porous emitters that realize sub-ambient daytime cooling.

For adsorption-based energy management, we explore porous adsorbents and structured adsorbers that advance both material capacity and system performance. NaBr-impregnated graphene aerogels provide high specific cooling power and reliable cycling, while NaBr-impregnated covalent organic framework aerogels exhibit higher working capacity and improved stability. Structural strategies, including freeze-casting for directional pore alignment and flow-driven growth of aerogels on tubular components, markedly accelerate adsorption-desorption dynamics. System demonstrations confirm substantial gains in adsorption heat pump efficiency and thermal energy storage power density.

Together, these studies demonstrate how porous materials, engineered into tailored architectures and integrated into systems, can enable high-performance and sustainable pathways for thermal energy management.

DATE: **Tuesday, 30 September 2025**

TIME: **11:00 – 11:45**

PLACE: **Building 414, Room 065E**
DTU, Technical University of Denmark

Virtual participation please see the following link:

<https://dtudk.zoom.us/j/62592416266?pwd=3Pb2HfJCIK6sn5683Aw4lhyqsGX7Of.1>

Danish pastry, coffee and tea will be served 15 minutes before the seminar starts.

All interested persons are invited.

Jan Becker Høgsberg

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