

**7th Academic Collaboration Seminar (ACS) NTUST - NIMS workshop**

## **DATA-DRIVEN APPROACHES FOR DESIGNING THERMAL INSULATING MATERIALS**

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The design of high-performance thermal insulating materials is crucial for efficient thermal management in modern applications. This presentation highlights how data-driven methodologies, particularly machine learning, can accelerate the development of thermal insulators by integrating experimental data with predictive modeling techniques. A key focus is the creation of accurate models for interfacial thermal resistance (ITR), which combine experimental measurements and machine learning algorithms to optimize heat flow across material interfaces.

Case studies will be presented to demonstrate the application of these models to thin-film thermal insulators, showcasing how data-driven strategies identify critical structural and material parameters that improve performance. By leveraging high-throughput analysis and experimental insights, these approaches provide a framework for rapidly designing materials with tailored thermal properties. This work underscores the transformative potential of data-driven innovation in addressing design challenges and advancing sustainable solutions in energy and thermal management.