

Department of Physics, National Central University



#### Colloquium

# **Thermal-Management Materials**

## for 3D-stacked Integrated Circuits

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#### Date: 2025/03/04(Tue) Venue: S4-625 Time: 14:00-16:00

Abstract :

To address the limitations of 2D scaling in lithography while meeting the semiconductor industry's demands for power density and performance, 3D stacking of devices has emerged as a pivotal advancement in device architecture and system integration evolutions. This method, while enabling further miniaturization of integrated circuits, introduces significant thermal management challenges due to increased thermal confinement. Poor thermal conductivity of interlayer dielectrics in the back-end-of-line exacerbates heat dissipation issues, potentially compromising device reliability and performance. Despite its critical importance, thermal management in 3D dense stacked systems remain underexplored compared to traditional 2D systems. In this talk, we examine key materials and strategies poised to enhance thermal management in 3D stacked configurations. We also discuss the necessary processing methods for integrating these materials into 3D architectures. Finally, we highlight existing and emerging thermal measurement techniques essential for evaluating thermal materials during both development and production stages.