

應用力學所專題討論公告

IAM Seminar Announcement

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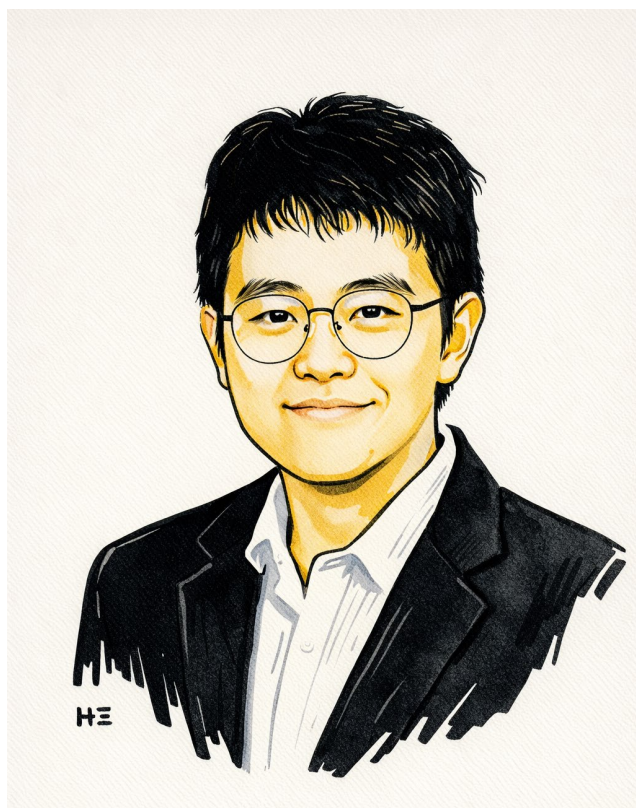
講題： Multi-Material Laser Powder Bed Fusion
for Next-Generation Multi-Functional
Components

主持人：陳瑞琳教授

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Multi-Material Laser Powder Bed Fusion for Next-Generation Multi-Functional Components

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摘要

Laser Powder Bed Fusion (LPBF) has emerged as a key additive manufacturing technology for fabricating complex metallic components with high geometric fidelity. However, conventional LPBF is inherently limited to single-material processing, restricting its ability to meet the increasing demand for components that require spatially tailored properties and multifunctionality. Multi-Material Laser Powder Bed Fusion (MM-LPBF) offers a transformative pathway by enabling the integration of dissimilar materials within a single build. Through controlled powder deposition strategies and layer-wise material distribution, MM-LPBF allows for the fabrication of components with site-specific composition and performance. This capability opens new opportunities for engineering advanced structures that simultaneously achieve multiple functional requirements, such as high strength, enhanced ductility, improved thermal management, and wear resistance.

This talk presents recent advances in MM-LPBF, focusing on the interfacial characteristics between dissimilar material combinations and their role in enabling performance beyond conventional single-material systems. The integration of in-situ sensing—such as optical and spectroscopic monitoring—with artificial intelligence (AI) is further highlighted for real-time detection of material distribution, defects, and process instability, enabling improved process control and reliability. Finally, the potential of MM-LPBF for next-generation applications, including thermal management, advanced structural components, and functionally integrated devices, will be discussed, along with key challenges toward scalable and intelligent multi-material additive manufacturing.