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“Mid-Infrared Laser Ablation for Mass Spectrometry Imaging at Sub-cellular Scales”

Robert Murray 氏

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日 時: 2026年4月20日(月) 13:30~14:30

場 所: 理学部1号館3階381号室

【Abstract】

Mass spectrometry imaging (MSI) is emerging as a transformative technique for spatial biology, multi-omics, and clinical pathology. Unlike traditional optical microscopy, which visualizes cells and tissues with photons, MSI creates images from molecules by measuring their mass-to-charge ratios with mass spectrometry. This shift from photons to molecules provides a powerful new view of biology but also raises fundamental challenges at the interface of analytical chemistry and photonics. In this talk, I will discuss how specifically engineered infrared laser sources, tuned to vibrational resonances such as the O–H stretch at 2.94 μm , can be engineered as precise ablation sources for MSI. By controlling wavelength, pulse duration, and fluence, we have demonstrated imaging at sub-cellular ‘resolutions’ (2 μm pixels) with enhanced molecular sensitivity, and directly visualized how plume dynamics govern the ion signal captured in the mass spectrometer. Beyond the technical results, I will reflect on the broader opportunities and challenges of navigating a path that merges ultrafast photonics with analytical chemistry, an often difficult but highly rewarding journey that is opening new routes toward high-resolution molecular pathology, high throughput sample screening, and laser-guided surgery.

使 用 言 語 : 英語 (English)

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