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Non-contact Submicron O-PTIR and Simultaneous Raman microscopy with Fluorescence imaging – A New Paradigm in Vibrational Spectroscopy

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The recent advent of Optical Photothermal IR (O-PTIR) spectroscopy, has enabled for the first time, true submicron spatial resolution (20x better than FTIR) infrared microscopy in far-field reflection mode, generating “FTIR transmission-like” spectral quality, without spectral artefacts and distortions such as Mie Scattering associated with traditional FTIR or other emerging QCL based IR microscopy systems. Furthermore, it is now possible to combine O-PTIR with Raman and widefield fluorescence for trimodal correlative microscopy.

Photothermal IR spectroscopy is not new and has been exploited for decades with techniques such as PhotoAcoustic Spectroscopy (PAS) and AFM-IR (nano-IR). Where O-PTIR differs to is that it uses a visible laser probe for detection, being analogous to the microphone in PAS and the AFM tip in AFM-IR. The use of this optical probe is the key enabling breakthrough in O-PTIR allowing for non-contact measurements, providing for advantages in capabilities relative to traditional FTIR/QCL microscopy but also in instrument architecture, thus enabling the first combined (correlative) IR and Raman (IR+Raman) platform that provides for simultaneous IR and Raman spectral information at the same time, from the same spot with the same submicron spatial resolution. When combined with fluorescence imaging, image contrast not visible in the brightfield image can be used to guide the O-PTIR measurements, without any image registration issues as the same sample, same platform and same objective is used for IR, Raman and fluorescence measurements.

These unique and exciting synergistic capabilities are now spawning interest in range of applications, from geochemical, to materials science, microplastics, life sciences and beyond.