Pushing the Limits of Biomedical and Biological FTIR Imaging

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Over recent years, interest has increased in pushing the diffraction limited spatial resolution performance of FTIR imaging systems, primarily using synchrotron based systems.
In this application note, we present a novel method of magnification enhancement achieved using existing objectives or novel objectives with high numeric aperture. The result is an FTIR system with high spatial resolution imaging capabilities in the order of 1 µm/pixel or lower. Uniquely, this configuration conserves the relatively large working distance of regular objectives (21 mm) by not requiring an objective change between magnification settings.
Furthermore we could show that a setup with a 25 x objective and a numeric aperture of 0,81 results in a pixel resolution of 0,66 µm and a achievable of spatial resolution of 1-2 µm.
FTIR images of a variety of biomedical samples were obtained using standard magnification FTIR, high magnification FTIR and the 25 x objective.
The results demonstrate that compared to standard magnification (5.5 µm), operating in high mode mode (1.1 µm), offers significantly added spectral and spatial detail and compared to synchrotron based high magnification systems, equivalent or better detail is observed,
Additionally, image acquisition times are ~10x faster than synchrotron instruments owing to the significantly larger field of views, together with the fact that full sized (128x128) FPAs can be used.
Furthermore, the ability to operate in standard magnification (5.5 µm) and high magnification (1.1 µm) modes without changing the objective, thus preserving the full objective working distance of 21 mm, means that users are not limited in the sample shape, size and form that can placed and measured beneath the microscope objective.
The 25x objectives, still preserving a working distance of 12 mm, reveals a revolutionary pixel resolution of 0,66 µm with a unique numeric aperture > 0,8. With this powerful tool and the high magnification capabilities new frontiers of biomedical imaging can be achieved and give deeper insights in biomedical research aspects.