DOI: 10.1017/S1431927603445352
Microsc Microanal 9(Suppl 2), 2003

STEP-SCAN AND CONTINUOUS SCAN INFRARED IMAGING OF CELLS AND TISSUES OF ATERIOSCLEROTIC PLAQUE – POTENTIAL APPLICATIONS

C.P. Schultz

Bruker Optics Inc, Life Sciences Division, Billerica, MA 01821

New methods and technology of infrared imaging will provide researchers in the biomedical field and clinician with new diagnostic capabilities in the near future. Applications are sufficiently matured that the next step in development can only be active collaborations between biomedicine and spectroscopists in the field of biomedical applications. Since any biological tissue normally very efficiently absorbs infrared radiation, whole body penetration such as in MRI applications is not in reach. For this reason, infrared methods could gain access to cells, tissues and organs through minimally invasive procedures. Invaluable information about cell and tissue biochemistry contained in infrared spectra could then provide physicians with new diagnostic features for the determination tissue properties and the state of diseases. Reference libraries containing infrared spectra of healthy and diseased tissues can be utilized to establish an online diagnosis during minimally invasive surgery procedures. One example is the detection of vulnerable arteriosclerotic plaques, the inherent structure of plaques and the 3-dimensional chemical composition. In order to utilize future near-infrared detection methods through modern fiber optics systems, infrared imaging of sectioned material will provide information about the nature of plagues (see Figures).

New techniques in infrared imaging have increased the measurement speed and the quality of the data obtained. Slow readout times of Focal Plane Array (FPA) detectors required a step-scanning approach in imaging. Faster readout times and improved interferometer technology allow today a more appropriate and well-known approach called rapid-scan imaging. The interferometer of an infrared spectrometer can work this way on a slow but continues scanning approach while constantly reading out the FPA detector. One infrared image can be produced in seconds and utilized to monitor even kinetic chemical processes. This step simplifying the technology pushes infrared imaging due to better applicability further into the clinical environment thereby providing new information for pathologists (see References [1-2]).

[1] C. P. Schultz, Technology in Cancer Research & Treatment 1 (2002) 95.
[2] L. H. Kidder et al., Nat. Med. 3 (1997) 235.

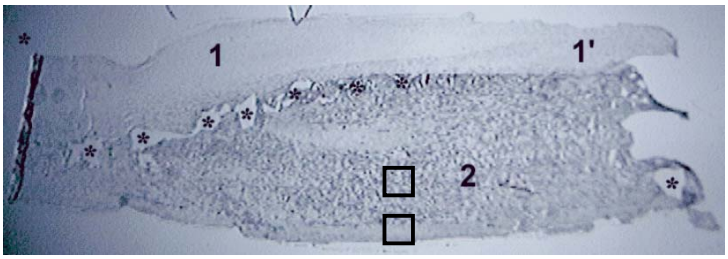

FIG. 1. Thin section of Arteriosclerotic Plague

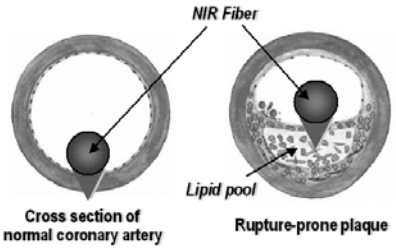

FIG. 2. Vessel Schematic

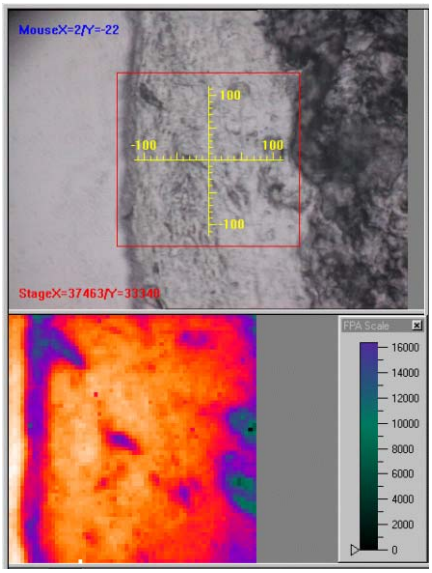

FIG. 3a. Infrared Image of Plague wall

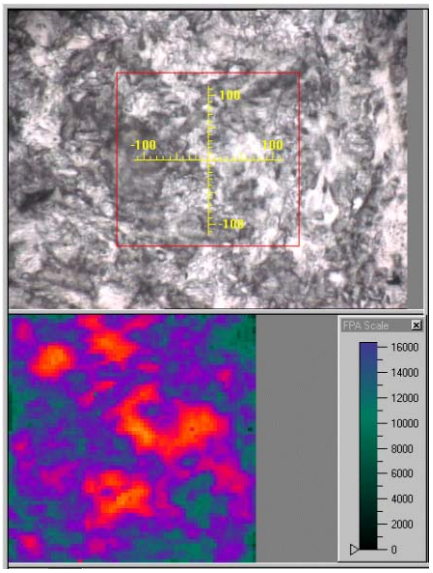

FIG. 3b. Infrared Image of Plague core

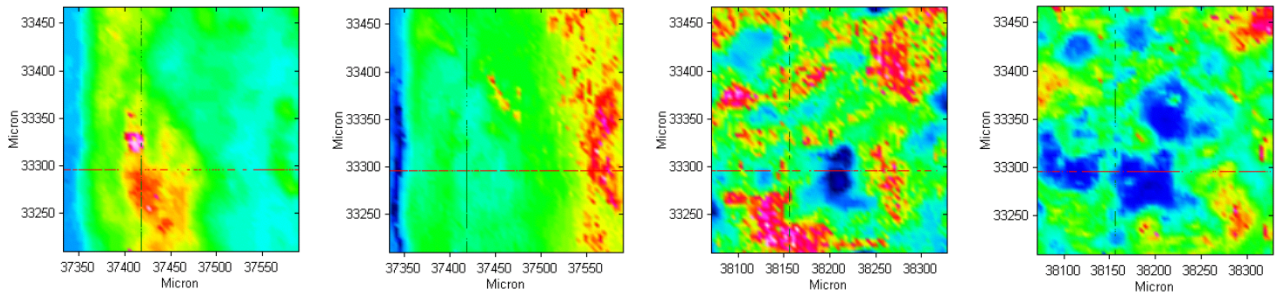

FIG. 4a-d. Chemical Image of protein (a,c) and lipid (b,d) of Plague wall and core.

https://doi.org/10.1017/S1431927603445352 Published online by Cambridge University Press