FT-IR microspectroscopy

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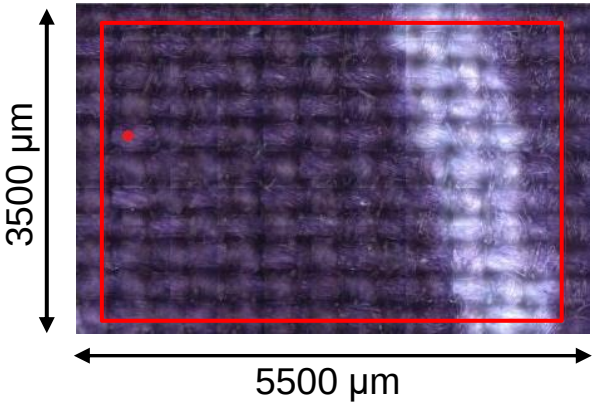
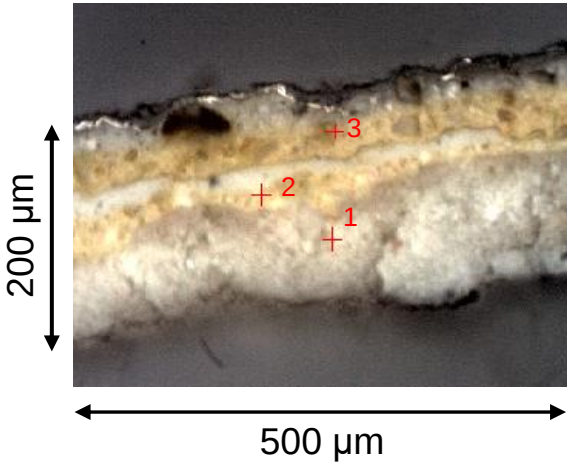
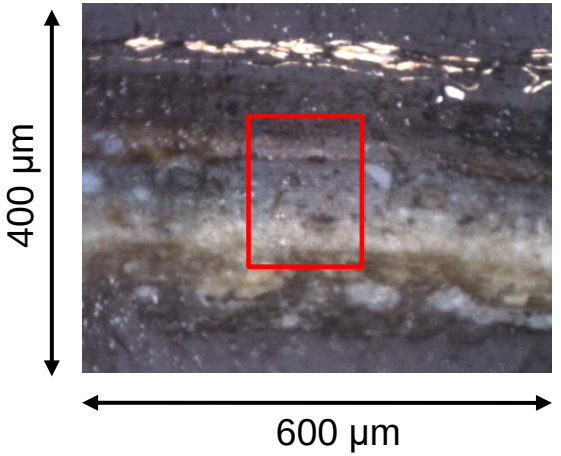
IR microspectroscopy

- Enables analysis of **very small samples**
  - Small particles, thin fibres, …
- **Local analysis** of details of large samples
  - Layer-by-layer analysis of multi-layer samples
- **IR mapping and Imaging**
  - Contrast occurs on the basis of some IR spectral properties



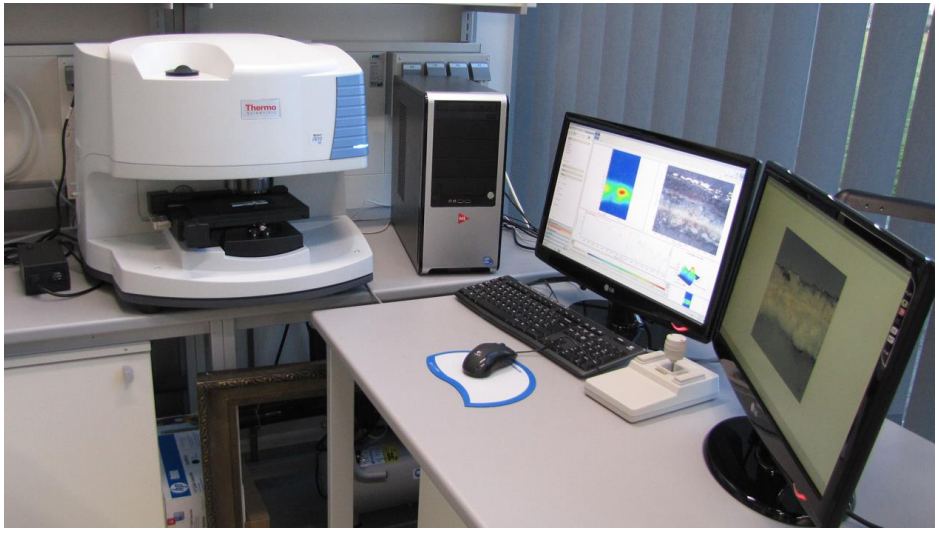




IR microspectroscopy

- Can be realised as
  - an „add-on“ to an FT-IR spectrometer or
  - a standalone FT-IR microspectrometer
- Different sampling techniques can be used
  - ATR, Transmission, Reflection

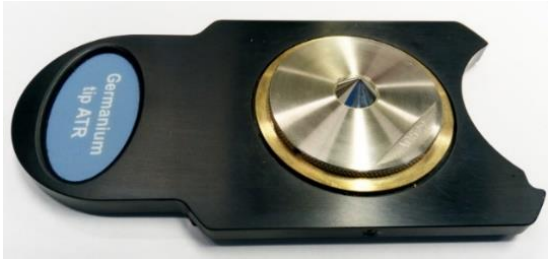
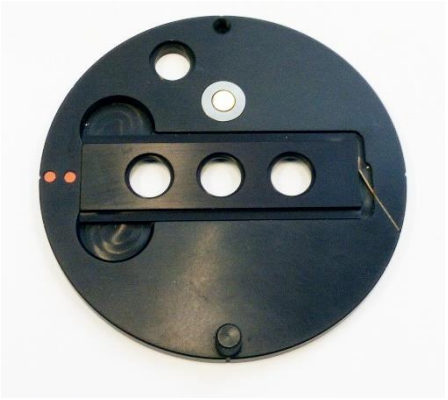
Bruker FT-IR Microspectroscopic Imaging
(used with permission)



Thermo Fisher Nicolet iN10 MX
FT-IR microscope

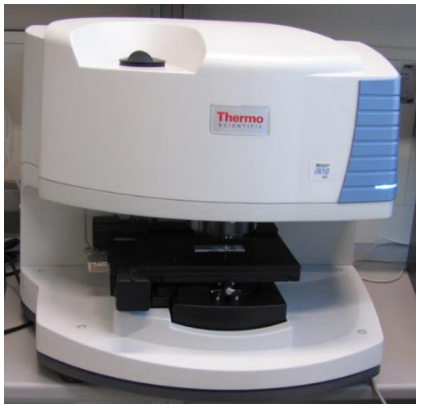
Thermo Fisher Nicolet™ Continuμm™ Infrared Microscope (Photo: www.thermo.com/)
(used with permission)

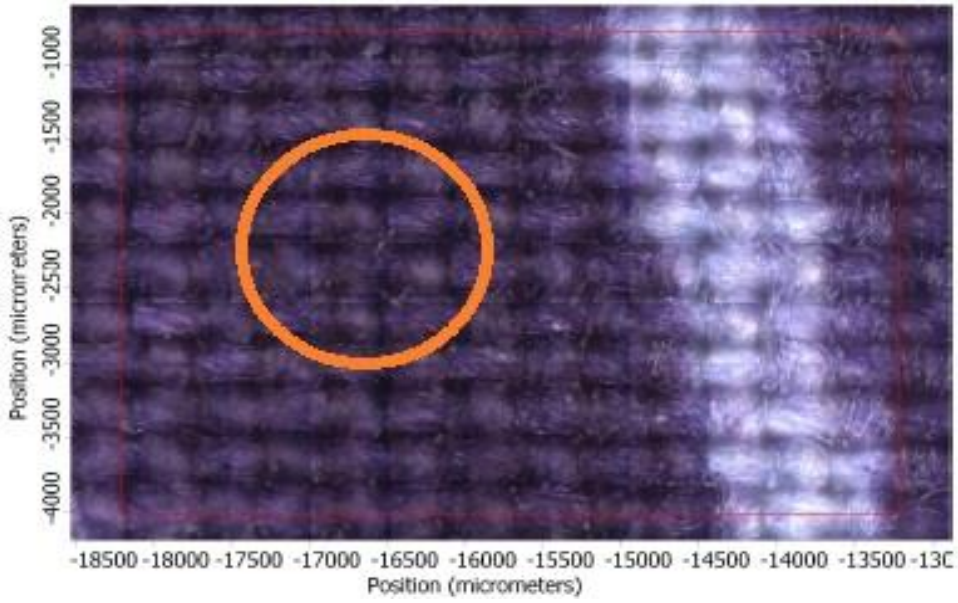
Sampling techniques

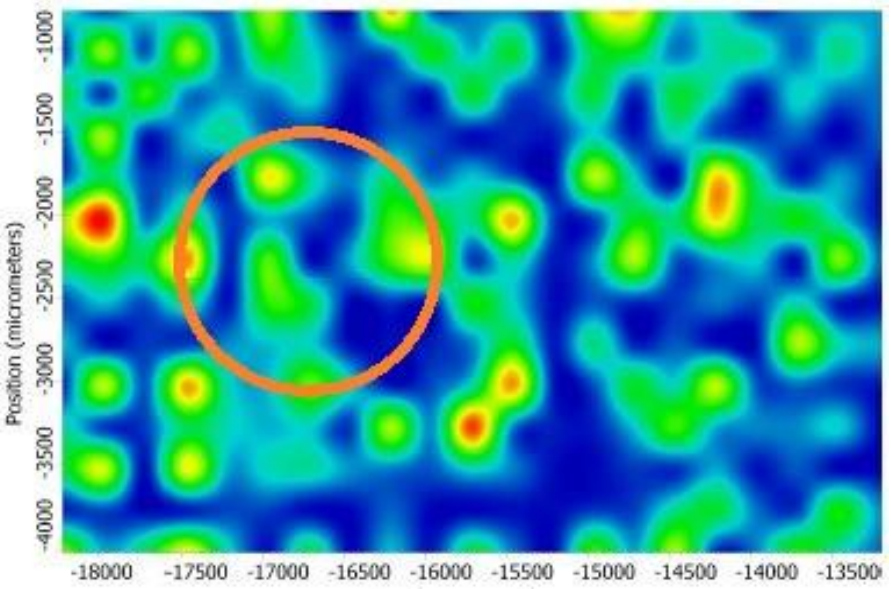
ATR	REFLECTION	TRANSMISSION
• Contact technique • Any solid samples can be analysed. • High signal to noise ratio • ATR spectra are not very different from the transmission mode spectra • Spectrum can be recorded from an area with few µm diameter	• Non-contact technique • Any solid samples can be analysed • Low signal to noise ratio • Reflectance spectra are different from the transmission mode spectra • For good spectrum the area should be around 100 µm in diameeter	• Non-contact technique • Sample should be very thin and transparent. • High signal to noise ratio • Spectra correspond to the typical IR spectra
		

Video: Analysis with IR microspectroscopy: https://sisu.ut.ee/heritage-analysis/book/31-ir-spectroscopy

Homogeneity analysis with ATR–FTIR mapping





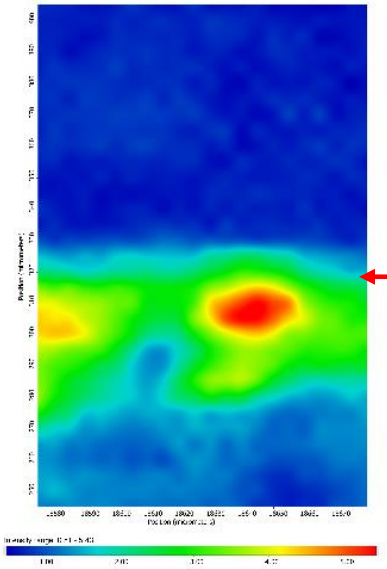


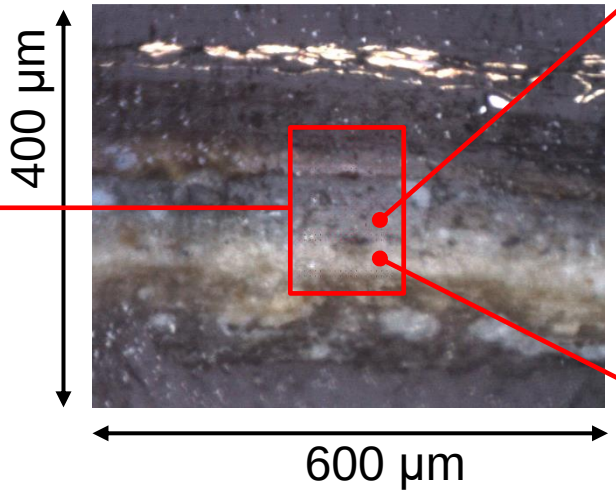
Polyester – cotton textile

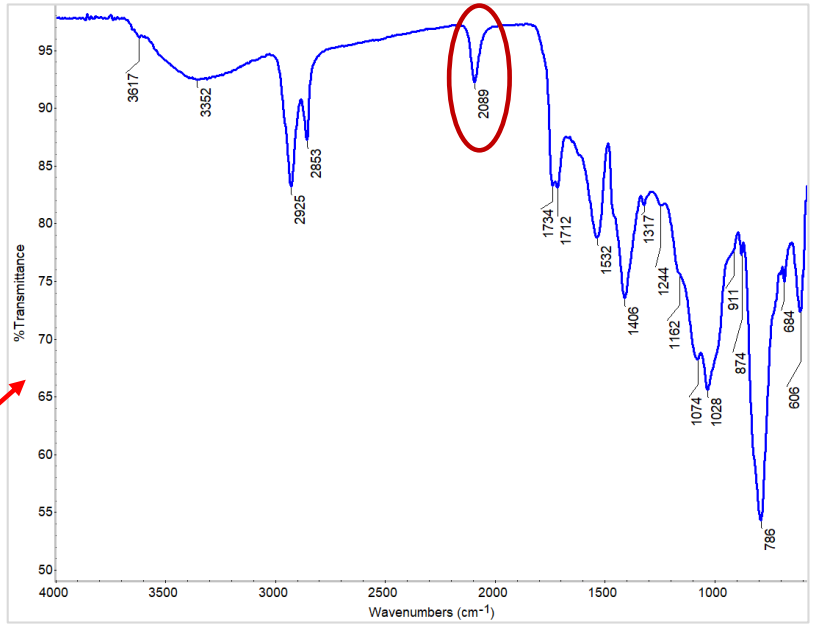
- Mapping made using ν C=O at 1714 cm^{-1}
- Area 16.25 mm^2, 294 spectra in total

Peets, P.; Leito, I.; Pelt, J.; Vahur, S. *Spectrochimica Acta Part A*. **2017**, *173*, 175−181.

IR spectra from specific points and mapping







Summary

- Useful technique for the analysis of
  - very small samples (few µm)
  - small details of large samples
- Different sampling techniques (transmission, reflection, ATR).
- IR mapping of selected areas on the sample and collecting multiple spectra.