FTIR spectroscopy

FTIR (Fourier Transform InfraRed) spectroscopy is an important tool in material analysis. In addition to the standard set-ups, we have two advanced spectroscopic techniques; dynamic FTIR spectroscopy and imaging FTIR spectroscopy. We have a long experience of analyzing material properties with FTIR spectroscopy. A reference database of spectra of various materials is a helping tool for the material identification.

FTIR spectroscopy provides extensive characterisation possibilities, e.g.:

- chemical composition
- analysis of product defects
- identification of impurities
- local chemical composition
- relative content and distribution, location or homogeneity of different components
- chemical variations along a sample
- molecular interactions
- viscoelastic properties.

A broad range of materials can be analyzed, for instance:

- complex polymeric materials
- single fibres
- wood
- pulp
- paper
- films
- composite materials
- packaging materials

Bulk, surface and layered structures can be analyzed separately.

A list of available instrumental set-ups is appended.

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FTIR SPECTROSCOPY

Static FTIR Spectroscopy

This standard static mode is used for qualitative analysis of different materials.

Measuring mode: Transmission
Spectral resolution: 4/8 cm^{-1} (0.1 cm^{-1} - 32 cm^{-1})
Spectral range: 4000 cm^{-1} - 400/700 cm^{-1}
Detector: DTGS/MCT
Sample thickness: ca. 20 µm - 40 µm
Measuring area: Ø 12 mm

ATR FTIR Spectroscopy

This mode is used for qualitative analysis of surface of various materials.

Measuring mode: ATR (i.e. attenuated total reflection) Crystal: ZnSe
Contact area: Ø 2 mm
Penetration depth: 2 µm
Spectral resolution: 4/8 cm^{-1} (0.1 cm^{-1} - 32 cm^{-1})
Spectral range: 4000 cm^{-1} - 650 cm^{-1}
Detector: DTGS
Sample thickness: up to 1 cm

Dynamic FTIR Spectroscopy

This technique is based on a combination of FTIR spectroscopy with DMA (i.e. dynamic mechanical analysis). It gives possibility for analysing molecular interactions in complex polymeric systems. Here, macroscopic property, i.e. viscoelasticity, of a polymeric material is closely coupled to submolecular cooperation, i.e. ultrastructure, depending on local environment in a polymeric material. The technique utilizes dynamic 2D FTIR (i.e. two-dimensional FTIR), which is an evaluation technique providing useful information about inter- and intra-molecular interactions in complex polymeric materials.

Measuring mode: Transmission
Spectral resolution: 4/8 cm^{-1} (0.1 cm^{-1} - 32 cm^{-1})
Spectral range: 3950 cm^{-1} - 700 cm^{-1}
Detector: MCT
Sample thickness: ca. 20 µm - 40 µm
Sample size: 20 mm x 25 mm

IMAGING FTIR SPECTROSCOPY

Imaging FTIR Microscopy

This technique is based on a combination of static FTIR spectroscopy with light microscopy. It gives possibility for analyzing chemical compositions on micrometer level of various materials. Also, distribution and location of different components across the thickness of a sample can be measured as well as its homogeneity.

Measuring mode: Transmission
Pixel resolution: 25 µm and 6.25 µm
Spectral resolution: 4/8 cm-1 (2 cm-1 - 64 cm-1)
Spectral range: 4000 cm^{-1} - 720 cm^{-1}
Detector: Linear Array MCT
Sample thickness: ca. 20 µm - 40 µm
Measuring area: up to 10 mm x 10 mm

Imaging ATR FTIR Microscopy

Surface of samples as well as layered structures can be analyzed using this mode.

Measuring mode: ATR (i.e. attenuated total reflection) Crystal: Ge
Contact area: Ø 600 µm
Penetration depth: 0.5 µm
Pixel resolution: 6.25 µm and 1.56 µm
Spectral resolution: 4/8 cm^{-1} (2 cm^{-1} - 64 cm^{-1})
Spectral range: 4000 cm^{-1} - 720 cm^{-1}
Detector: Linear Array MCT
Sample thickness: up to 0.8 cm

Point Mode FTIR Microscopy

Chemical composition of samples can be analyzed, but also chemical composition in layered structures, due to a possibility of running the system in so called line scan mode.

Measuring mode: Transmission
Aperture: 100 µm and 25 µm
Spectral resolution: 4/8 cm^{-1} (0.5 cm^{-1} – 64 cm^{-1})
Spectral range: 4000 cm^{-1} - 700 cm^{-1}
Detector: MCT
Sample thickness: ca. 20 µm - 40 µm

ID: 260

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