

## ● Description Advanced Training Courses/Users Training

### Course Programm:

1<sup>st</sup> day:

#### Introductory Part:

- Understanding FT-IR spectroscopy
- OPUS Basic Functionality

2<sup>nd</sup> to 5<sup>th</sup> day:

#### MID IR Users Training:

- Advanced OPUS Functionality for Mid IR Applications
- Sample Preparation and Surface Analysis
- Rapid Scan/Step Scan, Coupling Techniques <sup>(1)</sup>
- FT-IR Microscopy<sup>(1)</sup>
- Life Science/Protein/Microbiology <sup>(2)</sup>
- Dispersive and FT-Raman Spectroscopy <sup>(2)</sup>

2<sup>nd</sup> to 5<sup>th</sup> day:

#### NIR Users Training:

- OPUS for NIR Applications
- Quantitative NIR Analysis
- OPUS/IDENT Applications
- NIR Validation Issues

#### <sup>(1,2)</sup> Important Note:

These courses are held in parallel sessions. Each attendee can only participate in one users course!

### Course Dates:

For the corresponding dates please refer to the appropriate registration form.

### Venue:

Seminar Rooms „Fourier“ and „Michelson“ as well as Application Laboratories (2<sup>nd</sup> Floor) at:  
Bruker Optik GmbH  
Rudolf-Plank-Straße 27  
76275 Ettlingen  
Germany

### Time schedule:

#### Lectures, exercises:

09.00 a.m. - 05.00 p.m.

#### Coffee breaks:

11.00 a.m. and 03.00 p.m.

#### Lunch:

01.00 p.m.

### Documentation/lectures:

in English language

### Trainer

Application specialists of Bruker Optik

### Seminar fee includes:

- ◆ Practical exercises with PC stations and spectrometers
- ◆ Appropriate training from experts
- ◆ Documentation on CD-ROM and printouts
- ◆ Lunch and two coffee breaks per day
- ◆ Certificate of attendance
- ◆ Shuttle service between the hotel and Bruker Optik  
Meeting point: hotel reception

### Registration

Please contact your local Bruker office or Bruker Optik in Germany.

1<sup>st</sup> day:

MIR and NIR

### Introductory Part:

The practical English training courses in Germany take place once a year, usually in autumn. The courses deal with diverse application possibilities of both the related spectrometer and the OPUS software. The measurement and evaluation techniques are presented theoretically and by aid of practically oriented exercises and application examples.

#### ■ Understanding FT-IR Spectroscopy

This course offers a theoretical and practical introduction to FT-IR spectroscopy. The course addresses to unexperienced users as well as users who want to refresh their knowledge about the functionality of the interferometer and spectrometer optics.

After a theoretical introduction practically oriented aspects are discussed. Basic data manipulations and evaluations complete the practical exercises. The course gives the user a basic understanding on FT-IR spectroscopy.

- ◆ Introduction into FT-IR spectroscopy
  - Basic knowledge of the IR measurement technique
  - Principal structure of the FT-IR spectrometer
  - Measurement, evaluation, adaptation of measurement parameters

#### ■ OPUS Basic Functionality

The OPUS Basic Functionality course addresses to FT-IR spectrometer users who do not yet have intensive experience in the use of the spectroscopy OPUS software.

Due to the course structure even users who have not worked with the software up to now will get an introduction into the operation and the functionality of the program. The trainer uses a PC connected to a beamer. During the course two attendees will have access to one PC for practising the functions which are shown by the instructor simultaneously.

- ◆ Introduction into OPUS
  - Concept and operation elements
  - Load spectra
  - Display functions
- ◆ Measurement menu
- ◆ Basic manipulation and evaluation functions
- ◆ User management and configuration of individual workspaces

**MID IR Users Training:****Advanced OPUS Functionality for Mid IR Applications**

- ◆ Integration and quantification (based on Lambert-Beer's law)
- ◆ Print, work with existing templates
- ◆ Create individual print templates
- ◆ Extended OPUS functions: library search
- ◆ Overview about extended packages

The following course days comprise typical mid IR application techniques. Generally, the methods are introduced in the morning sessions. In the afternoon practical exercises with regard to the different measurement techniques and evaluations are carried out at the FT-IR spectrometers. Independent experiments have been prepared and can be executed in smaller groups of attendees. There is the possibility to practise and to ask individual questions.

The attendees should already have experience of the use of their own FT-IR spectrometers!

**Sample Preparation and Surface Analysis**

- ◆ Basic sample preparation
  - KBr/PE-pellets
  - Nujol suspensions
  - Liquid cells
- ◆ Attenuated total reflection (ATR)
  - Micro-ATR units
  - ATR materials
- ◆ Specular reflection and IRRAS
  - Kramers-Kronig-transformation
  - Polarisation modulation technique (PMA 50: PM-IRRAS and Vibrational Circular Dichroism (VCD))
- ◆ Diffuse reflection (DRIFT)
  - Sample preparation
  - Measurement accessories
- ◆ Photoacoustic spectroscopy (PAS)
- ◆ Practical training courses

**Rapid Scan/Step Scan, Coupling Techniques (1)**

- ◆ Time resolved FT-IR spectroscopy: Rapid Scan and Step Scan
 

Based on examples criteria are derived which help the user to choose the suitable technique for his application.

  - Technical preconditions
  - Step Scan: Reproducible kinetics
  - Step Scan: Trigger schemes, parameters and data acquisition
  - Rapid Scan: Time resolved single event reactions
  - Rapid Scan: Method editor
  - Limits of time resolved spectroscopy
  - Practical sessions including OPUS/3D

- ◆ Coupling Techniques
  - Thermogravimetric FT-IR coupling TGA-/DSC-IR
  - Chromatographic FT-IR coupling, GC-, GPC-, HPLC-IR
  - OPUS/CHROM and OPUS/3D
  - Digital library search

**FT-IR Microscopy (1)**

- ◆ Theory and application
  - Sample handling
  - Basic features of the HYPERION FT-IR microscope
  - ATR objective
  - GIR objective
- ◆ Work with OPUS/MAP and OPUS/VIDEO
  - Data recording, parameter selection
  - 3D display
  - Spectrum integration
  - Image/intensity overlays
  - Object selection on the video screen
  - ◆ Data evaluation, data presentation and documentation with OPUS/3D
  - 3D-Plot; Contourplot
  - Post-run manipulations

**Life Science/Proteins/Microbiology (2)**

- ◆ Proteinanalysis/Microbacterial Identification
  - Protein conformation analysis
  - Protein concentration
  - Secondary structure
  - Food relevant and clinical microorganisms

**Dispersive and FT-Raman Spectroscopy (2)**

- ◆ Introduction to Raman spectroscopy
  - The Raman effect
  - Configurations of dispersive and FT-Raman spectrometers
  - Application areas
- ◆ FT-Raman spectroscopy
  - Instrumentation, components, accessories
  - Applications
- ◆ Raman Microscopy
  - Instrumentation, components, accessories
  - Applications
  - Measurement and data evaluation
  - Acquisition of spectra with OPUS/MAP and OPUS/VIDEO
  - Methods to suppress and avoid fluorescence
  - Data evaluation with OPUS/3D

**NIR Users Training:****OPUS for NIR Applications**

The course OPUS for NIR Applications addresses to all users who do not have much experience with the spectroscopy software OPUS. Special attention will be paid to the requirements of those users who work in

the field of NIR applications, i. e. only functions being relevant for the NIR spectroscopy are taken into consideration.

- ◆ NIR spectroscopy
  - Measurement techniques, accessories
  - Applications
- ◆ Introduction into OPUS and OPUS/LAB
  - General operations
- ◆ Simple functions for spectra processing (e. g. normalization, derivatives)
- ◆ User administration
  - Setting up users
  - Customizing the user interface
  - Working according to GMP
- ◆ Overview of the OPUS packages

**Quantitative NIR Analysis**

The practical course for the OPUS/QUANT software package offers a short introduction into the theory of multivariate calibration. The attendees learn the use of the OPUS/QUANT software with the help of many practical NIR examples.

- ◆ Quantitative Analysis
  - Basic theory
  - Sample selection
  - Impacts of reference methods
- ◆ OPUS/QUANT
  - Setting up a QUANT method
  - Calibration and optimization
  - Validation
  - Displaying and plotting the calibration results
  - Quantitative analysis
- ◆ QUANT examples with exercises on the PC data stations

**OPUS/IDENT Applications**

The basics of NIR spectra identification are explained with the help of practical examples and the possibilities of the IDENT software are shown. The attendees learn to build up multilevel IDENT libraries and to validate them.

- ◆ Basics
  - Pre-treatment of data
  - Comparison of spectra
  - IDENT algorithms
  - Factorization
- ◆ IDENT software
  - Library structure
  - Validation
- ◆ Practical applications of the IDENT software
  - Raw material control

**NIR Validation Issues**

- ◆ Validation of NIR spectrometer
- ◆ Software validation
- ◆ Compliance to 21 CFR part 11
- ◆ Use of OPUS in a GMP compliant environment

(1,2) Important Note:

**These courses are held in parallel sessions. Each attendee can only participate in one user course!**