# *Diagnosis of human brain tumors by FTIR imaging*

Steller, W., Krafft, C., Salzer, R.

Institute of Analytical Chemistry, Dresden University of Technology,
01069 Dresden, Germany.

Objective of the work is the development of diagnostic methods based on infrared spectroscopy. Reference samples and chemometrical methods are required to evaluate small changings in the spectra. In cooperation with the department of neurosurgery (University Hospital "Carl Gustav Carus", TU Dresden), 300 samples were collected from healthy tissue and human brain tumors. For analysis by FTIR imaging, the samples were cut in 10 µm thin sections with a microtome, immediately transferred to infrared transparent $CaF_2$ slides and dried on air. Directly adjacent tissue sections were prepared for standard diagnosis by histopathology.

FTIR images were recorded in transmission mode by a Bruker Hyperion spectrometer, which belongs to a new generation of FTIR spectrometers using a 64 x 64 pixel Focal Plane Array (FPA) as detector. With the FPA detector 4096 spectra can be collected within 10 minutes. The area of an FPA image in the macro chamber covers 4 x 4 $mm^2$. The spatial resolution per pixel is 60 µm. Using an microscope with a 15 fold magnification objective, the imaging area is reduced to 270 x 270 µm with a spatial resolution of 4 µm.

For analysis of the large data sets, a combination of chemometrical methods had to be used. Spectral variances which are diagnostic of specific brain tumors could be identified by Principle Component Analysis (PCA). Using the algorithm "Soft Independent Modeling of Class Analogy" (SIMCA), spectra were classified to brain tumors. In the next step, data sets which were not included in the classification model, were classified with high specificity and sensitivity.

The capabilities of this approach for tumor differentiation will be presented.

**ACKNOWLEDGMENT**
The research of the junior research group "Molecular Endospectroscopy" is supported by the Volkswagen foundation.