

**FLOW ANALYSIS COUPLED TO INFRAREDSPECTROSCOPY  
SPECTROSCOPY: A POWERFUL TOOL FOR PROBLEM  
SOLVING IN ANALYTICAL CHEMISTRY**

Bernhard LENDL

*Institute of Analytical Chemistry, Vienna University of Technology,  
Getreidemarkt 9-151, A-1060 Wien, email: belndl@mail.zserv.tuwien.ac.at*

This contribution aims to highlight benefits gained from the combination of flow analysis (FA) with Fourier transform spectroscopy by reporting recent results in the fields of process analysis and time resolved infrared spectroscopy.

In the first example a fully automated FIA-ATR-FTIR system for fermentation control is presented. The process investigated was the Acetone-Butanol-Ethanol (ABE) fermentation which has attracted renewed interest recently as an alternative and environmentally friendly method for the production of solvents. Using an automated flow injection system, problems arising from biofouling of the sensing surface (ATR), pH variation during the fermentation as well as gas formation could be solved making the continuous monitoring of 5 target analytes during complete feed batch fermentations possible.

In the second example a universal approach for fast time resolved MIR spectroscopy of arbitrary chemical reactions in solution based on a specially developed multi-sheath flow mixer is presented. The micro-machined mixer is made of polymers and produced on top of IR transparent CaF<sub>2</sub> windows. The developed mixer produces out of two macroscopic streamlines an alternating sequence of micro-streamlines (width below 20 μm). Due to the short residence time (below 5 ms) of the stream lines in the flow cell and due to the fact that strongly laminar conditions prevail hardly any mixing occurs as long as the flow is maintained. However, upon stopping the flow rapid diffusion based mixing occurs which allows to initiate any chemical reaction of interest and to follow the reaction dynamics on a molecular basis. In this presentation the principles of the new technique will be outlined as well as first data on selected chemical reactions shown.