

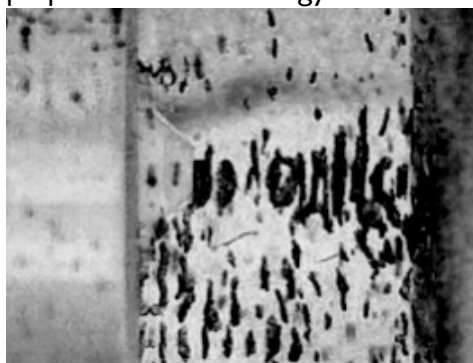
## Ultrasound enhanced Vibrational Spectroscopy Probe

### BACKGROUND

The growing use of bioprocesses as a manufacturing route demands the development of fast and reliable on-line sensors for process monitoring and control. The offered technology provides the possibility to obtain molecular-specific information from the infrared absorption spectra delivered by the ATR FT-IR spectroscopy. Acquisition is performed on-line within the bioreactor, independently for the host liquid (supernatant) and the particles (cells). Therefore, process control can be based on the composition of the liquid (nutrient content, enrichment of metabolic end-products) and the physiological status of the microorganism accessible by the ingredients within the cells. Other fields of application like crystallization monitoring (host liquid composition, crystal growth) and similar can be targeted as well.

### TECHNOLOGY

This technology utilizes the principle of ultrasonic particle manipulation enabling the spatial control of said particles for mid-IR ATR spectroscopy purposes. This technology is based on the combination of mid-IR ATR



spectroscopy and the principle of ultrasonic particle manipulation enabling the spatial control of said particles. The Stage of development is proof of concept with various types of particles and liquids. Probe's prototype successfully employed in measurements. Ready-to-go prototype under construction.

Fig 1: suspended yeast cells pushed to ATR

### BENEFITS

- *ATR (attenuated total reflection) FT-IR spectrometry in mid-infrared*
  - molecular specific information
  - especially adapt for organic compounds, fingerprint region
  - suitable for aqueous solutions
- *Evanescent field populated/depopulated with cells thanks to ultrasonic particle manipulation*
  - specific in regard to whether spectrum of particles or liquid is measured
  - safe for biological material, including living cells
  - almost real-time data acquisition
- *Fully-immersed on-line probe*
  - no changes of environment leading to metabolic reaction or similar issues
  - ultrasonic transducer capable of biofilm prevention and sensor auto-cleaning

### TARGET PARTNERS & OPTIONS

Manufacturers & Users of vibrational spectroscopy equipment, F&E cooperation, licence agreement, patent selling

**REFERENCE:**  
M043\_2013

### APPLICATIONS:

- monitoring of a fermentation (crystallisation) process
- control & optimisation of such processes
- quality control of suspensions

### KEYWORDS:

process monitoring, mid-IR spectroscopy, fully immersible on-line probe, fast (real-time) data acquisition, ultrasound particle manipulation, attenuated total reflection (ATR), independent measurement of particles and host liquid of suspensions, cell suspensions, fermentation, fed- batch/ continuous bioreactor, chemostat

### IPR:

International Patent Application pending (WO 2010/078612 A1)

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