Culture Fluorescence Studies for Process Monitoring and Control in Biotechnology

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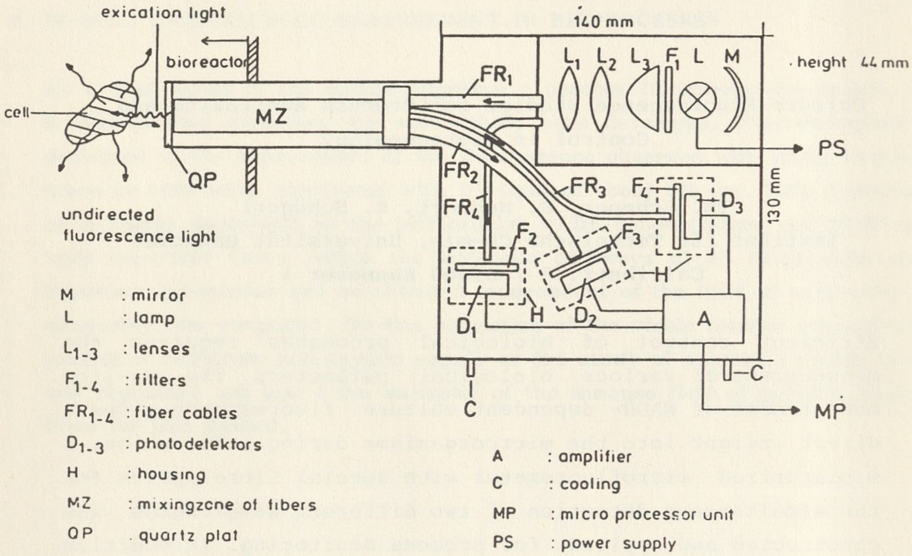
Efficient control of biological processes requires the measurement of various biological parameters. The on-line measurement of NADH- dependent culture fluorescence gives a direct insight into the microorganisms during cultivation. A miniaturized microfluorometer with special fibre optics for the simultaneous detection of two different wavelengths was constructed and applied for process monitoring. In addition an Ingold prototyp fluorometer (Dr. Ingold AG, Switzerland) was also studied

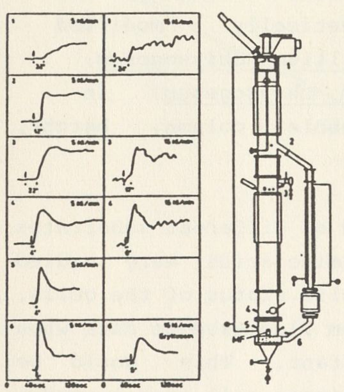
Cultivation processes for different microorganisms (Saccharomyces cerevisiae, several strains of Escherichia coli (including genetically modified strains), Zymomonas mobilis, Penicillium chrysogenum, Spodoptera frugiperda, Penicillium chrysogenum) in different bioreactors (STR, bubble column, batch-, continuous-cultures) were monitored.

The effect of cell concentration and of different substrates (e.g. glucose, ethanol, oxygen and amino acids) were studied to provide information on the metabolic status of the cells. Biomass estimation was performed from fluorescence data when cultivation parameters were constant. This would be interesting for the estimation of living cell mass in media with solid particles.

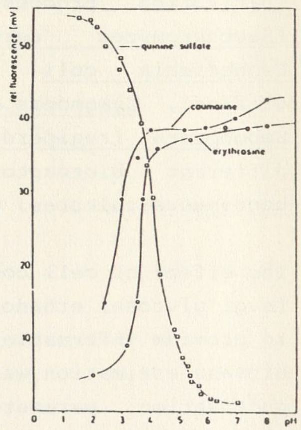
The sensor can also be used for studying the mixing time behaviour in bioreactors during cultivation. Mixing time experiments can be performed during culture fluorescence monitoring, when using a fluorometer for the simultaneous detection at two different wavelengths.



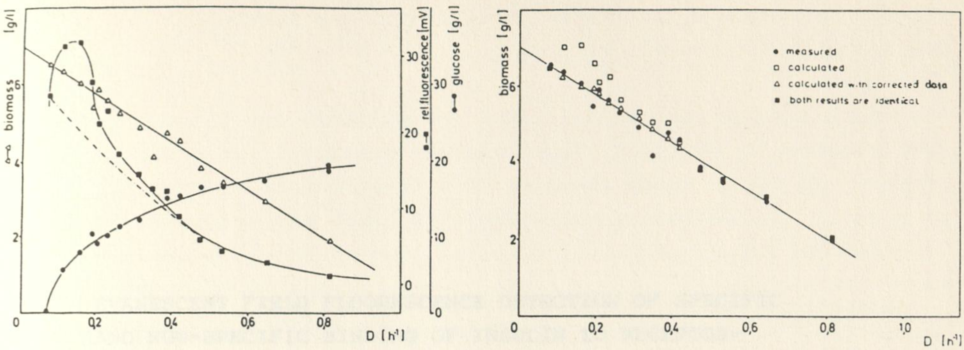
SCHEMATIC DESIGN OF THE MICROFLUOROMETER PROBE



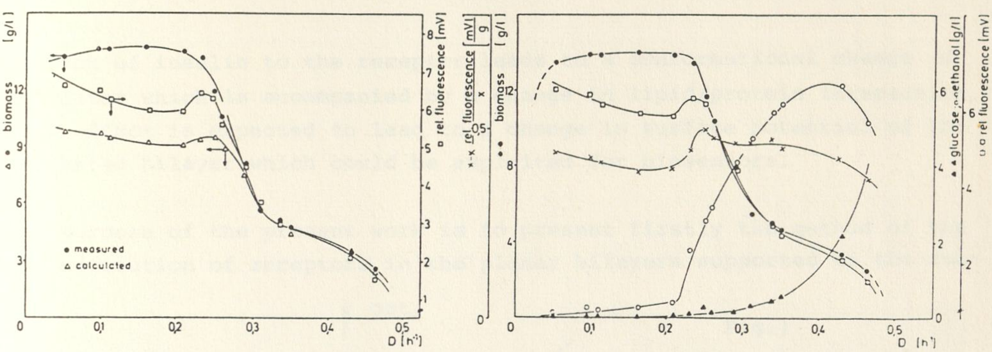
MIXING TIME BEHAVIOUR IN BUBBLE COLUMN (MF:SENSOR)



PH-EFFECT ON TRACER FLUORESCENCE



CONTINUOUS CULTIVATION OF <u>E.COLI</u> 5K IN GLUCOSE CONTAINING MEDIUM AND BIOMASS ESTIMATION



AEROBIC CONTINUOUS CULTIVATION OF <u>S.CEREVISIAE</u>