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Application of an Online-Biomass Sensor in an Optical Multisensory Platform Prototype for Growth Monitoring of Biotechnical Relevant Microorganism and Cell Lines in Single-Use Shake Flasks

Christian Ude[1], Jörg Schmidt-Hager [1], Michael Findeis[2], Gernot Thomas John[2], Thomas Scheper[1] and Sascha Beutel[1]
[1]Leibniz University of Hanover, Institute of Technical Chemistry, Hanover, Germany
[2]PreSens Precision Sensing GmbH, Regensburg, Germany

Abstract:

In the context of this work we evaluate a multisensory, noninvasive prototype platform for shake flask cultivation by monitoring three basic parameters (pH, pO_2 and biomass). The focus lies on the evaluation of the biomass sensor based on backward light scattering. The application spectrum was expanded to four new organisms in addition to *E. coli K12* and *S. cerevisiae* [1]. It could be shown that the sensor is appropriate for a wide range of standard microorganisms, e. g., *L. zeae*, *K. pastoris*, *A. niger* and CHO-K1. The biomass sensor signal could successfully be correlated and calibrated with well-known measurement methods like OD_{600}, cell dry weight (CDW) and cell concentration. Logarithmic and Bleasdale-Nelder derived functions were adequate for data fitting. Measurements at low cell concentrations proved to be critical in terms of a high signal to noise ratio, but the integration of a custom made light shade in the shake flask improved these measurements significantly. This sensor based measurement method has a high potential to initiate a new generation of online bioprocess monitoring. Metabolic studies will particularly benefit from the multisensory data acquisition. The sensor is already used in labscale experiments for shake flask cultivation.

Key-words: biomass sensor, light scattering, optical density, process monitoring, shake flask