Abstract:

In the context of this work we evaluate a multisensory, noninvasive prototype platform for shake flask cultivation by monitoring three basic parameters (pH, pO2 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 OD600, 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