Implementation of Raman spectroscopy into bioprocessing

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Project description

As regulatory agencies direct the biopharmaceutical industry to gain a deeper understanding of their bioprocesses the industry is actively searching for more advanced analytical technologies. With the implementation of process analytical technology (PAT) manufacturers are moving towards online monitoring and advanced process control to ensure product quality [1].

The adoption of PAT has led to the development of new process analysis tools which can be implemented in bioreactor systems for direct online measurements. In-line microscopy allows the direct monitoring of the bioreactor cell culture. This provides the opportunity to measure cell culture conditions from the morphological properties of individual cells [2]. Raman spectroscopy is based on the vibrational states of molecules and offers a non-contact and non-destructive analytical method which can be used for the determination of nutrient levels [3].

The aim of this project is to implement in-line microscopy and Raman spectroscopy into bioprocessing to improve process understanding and to develop advanced process control strategies. The process used to configure and test these analytical techniques will be the cultivation of budding yeast (S. cerevisiae). The first objective targets the successful implementation, calibration and validation of the SOPAT in-line microscope and a Raman spectrometer in a bioreactor system. This includes the setup of an automated imaging and image processing protocol for the SOPAT that can retrieve culture parameters from the individual yeast cells. This protocol will be combined with a process for Raman spectrum analysis into a combined analytical framework. After the establishment of a successful monitoring setup the project will advance to using these techniques for the development of process control strategies controlled by online monitoring.

References

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