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## Bioprocess Monitoring and Control

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Process monitoring and control are fundamental to all processes; this holds especially for bioprocesses, due to their complex nature. Usually, bioprocesses deal with living cells, which have their own regulatory systems. It helps to adjust the cell to its environmental condition. This must not be the optimal condition that the cell needs to produce whatever is desired. Therefore, a close monitoring of the cell and its environment is essential to provide optimal conditions for production. Without measurement, no information of the current process state is obtained. In this book, methods and techniques are provided for the monitoring and control of bioprocesses. From new developments for sensors, the application of spectroscopy and modelling approaches, the estimation and observer implementation for ethanol production and the development and scale-up of various bioprocesses and their closed loop control information are presented. The processes discussed here are very diverse. The major applications are cultivation processes, where microorganisms were grown, but also an incubation process of bird's eggs, as well as an indoor climate control for humans, will be discussed. Altogether, in 12 chapters, nine original research papers and three reviews are presented.

