



Small Sensors Go Big: Towards High-Resolution Monitoring of Industrial Fermentations

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Small Sensors Go Big: Towards High-Resolution Monitoring of Industrial Fermentations

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Abstract:

Miniaturized sensors are shaping new opportunities for bio-based manufacturing. Whether food, pharma or chemical production, fermentation processes form an integral part of many key industries and face high demand in this growing bioeconomy. However, monitoring and control of bioprocesses remain challenging tasks due to the limitations of current measurement devices. Concentration gradients, for example, are typical phenomena in large-scale industrial fermentations and can lead to substantial performance losses. Such conditions go unnoticed by local sampling campaigns using standard analytical probes. Microfabricated sensors allow an improved spatial surveillance of production units with sensors located in several critical locations, and even with freely floating sensors in the fermentation broth. These sensors provide continuous on-line data regarding key metabolites and empower plant operators to obtain an all-round view of the fermentation conditions. This is only a small step away from data-driven control decisions and efficient error forecasting. GreenLogic is a research initiative exploring the application potential of biosensors for butanol production, a next-generation biofuel with properties similar to gasoline. In this frame, the authors will report on a novel enzyme-based sensor for butanol quantification and discuss sensor requirements for industrial diagnostic systems. Sensor applications for high-throughput process design will also be addressed.