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Monitoring of Oxygen, pH, CO₂, and Biomass in Smart Single-Use Shake Flasks

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Abstract:

Shake flasks enjoy great popularity due to their ease-of-use and cost-effectiveness. Furthermore, using single-use shake flasks provides additional advantages over reusable glass versions, since they do not need to be cleaned or pre-sterilized. Despite their widespread use, there are, however, clear disadvantages associated with using shake flasks, which are primarily related to the lack of measurement and control capabilities. Therefore, this article discusses how optical sensors can be employed in single-use shake flasks to measure oxygen, carbon dioxide, pH, and biomass.

Keywords: Disposable cultivation systems, Erlenmeyer shake flasks, Online sensing, Optrodes, Orbitally shaken bioreactor