An Industrial Perspective on Scale-Down Challenges Using Miniaturized Bioreactors

Miniaturized stirred bioreactors (MSBRs) are gaining popularity as a cost-effective approach to scale-down experimentation. However, realizing conditions that reflect the large-scale process accurately can be challenging. This article highlights common challenges of using MSBRs for scale-down. The fundamental difference between oxygen mass transfer coefficient (kLa) and oxygen transfer rate scaling is addressed and the difficulty of achieving turbulent flow and industrially relevant tip speeds is described. More practical challenges of using MSBR systems for scale-down are also discussed, including the risk of vortex formation, changed volume dynamics, and wall growth. By highlighting these challenges, the article aims to create more awareness of these difficulties and to contribute to improved design of scale-down experiments.

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