Poster

Bioreactor's optimization through an innovative agitation-aeration system

Zapata Noa, Patricia(1), Garrido, Fernando (1), Fernández, Carlos(1), López-Viso, Carlos (1), Del Carmen, Cristina (1), Dávila, Javier(1)(2), Herrero, Inés (1) (3),

(1) R&D / Biomixing, S.L., Address: C/ Pablo Iglesias 7, Zip Code 41928 (Palomares Del Río)

(2) Founder/ Escuela Técnica Superior de Ingeniería, C. de los Descubrimientos, s/n. Pabellón Pza. de América

(3) Founder/ Universidad Pablo de Olavide, ctra. Utrera, Km. 1, 41013 (Sevilla)

Tutor académico: Herrero Chacón, Inés

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ABSTRACT

Motivation: Bioreactor systems are essential for optimizing biotechnological processes in industries like pharmaceuticals and food. Traditional systems, such as Rushton impellers, face challenges with energy inefficiency and poor oxygen transfer. The BioMixing's aeration and agitation system, based on CFD simulations, offers a patented solution to improve oxygen transfer, mixing efficiency, and overall productivity (Ashok et al., 2017).

Methods: The system's performance was evaluated in two main experiments: 1) kLa (volumetric mass transfer coefficient) measurement via oxygen saturation and nitrogen purging (Vanags & Suleiko, 2022), and 2) mixing time measurement with the iodine-starch method.The experimental procedures were carried out following the guidelines outlined in the Dechema protocol. Both experiments were conducted to compare Rushton's aeration-agitation system with our innovative system, aiming to identify significant differences between them.

Results: The BioMixing system achieved a remarkable 170% improvement in kLa at 250 rpm, and up to 60% at 400 rpm, compared to the conventional Rushton system. This enhanced oxygen transfer, especially at lower revolutions, is crucial for optimizing production processes in industries such as pharmaceuticals. Furthermore, the mixing time experiment demonstrated significant improvements in homogenization and medium distribution. At 700 rpm, the BioMixing system delivered performance enhancements of up to 29.4%, reinforcing its potential for more efficient bioprocessing (Nienow, 1998; Kelly, 2008).

Conclusion: The BioMixing system outperforms traditional bioreactors in key parameters such as oxygen transfer and mixing efficiency, offering a promising solution for enhancing biotechnological productivity and sustainability.y. Future work will refine its application for broader microbial cultivation (Wang et al., 2020).

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