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Production of an oil-degrading bacterial consortium in an airlift bioreactor: Insights into the mass transfer of the oil and oxygen.

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Abstract

The production of oil-degrading bacteria in multiphase airlift reactors (ALBs) could be limited by the mass transport of both the gaseous and oil phases. In our study, the mass transfer rates of hexadecane and oxygen (HTR/OTR) were evaluated during the production of oil-degrading bacteria in a 3-L airlift reactor. To improve the HTR/OTR ratios during kinetics, a high initial concentration of hexadecane (77 g L^{-1}) and constant superficial gas velocity (U_G) in the range of $1.5\text{-}3.5 \text{ cm s}^{-1}$ were used. Under these conditions, all initial HTR/OTR were close to the stoichiometric consumption ratio (SCR, ~ 0.28), which in turn decreased at the end of the culture until 0.173 ± 0.013 , 0.108 ± 0.006 and $0.123 \pm 0.006 \text{ (g HXD) (g O}_2\text{)}^{-1}$ for U_G of 1.5 , 2.5 , 3.5 cm s^{-1} , respectively. The evaluation of the Damköhler numbers suggested an enhancement of HXD mass transport that allowed for obtaining a

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