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GAS HOLD UP IN THE CULTIVATION OF A PETROLEUM-DEGRADING BACTERIAL CONSORTIUM

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Abstract

The hydrodynamic behavior of bubble column bioreactors (BCB) is strongly dependent on the bubbly flow regime. Therefore, the influence of superficial gas velocity (U_g) and Sauter mean diameter (d_{32}) on gas hold up (ϵ_g) was evaluated for the cultivation of a petroleum-degrading consortium. Hydrodynamic parameters were determined by photographic techniques. Also, the biomass cultivation was quantified by suspended solids formation (SS). Our findings indicated that the d_{32} increased at high U_g values (0.9-1.2 cm s⁻¹), but decreased with the presence of Tween 20 surfactant (0-0.15 mL L⁻¹) in the model medium. An enhancement in the ϵ_g was observed at high U_g values (1.0-1.3 cm s⁻¹). Interestingly, ϵ_g values ranging from 0.02 to 0.024 reported a high concentration level of SS (8-10 g L⁻¹) during the hexadecane degradation. Particularly, ϵ_g value of 0.024 was a convenient level to cultivate the consortium resulting in changes in bacterial population distribution, due to oxygen and hydrocarbon bioavailability. According our results, the ϵ_g is proposed as key factor related to mass transfer phenomena and agitation on the cultivation of petroleum-degrading consortium.

Key words: biodegradation, bubble column bioreactor, consortium, gas hold up, petroleum

Received: August, 2013; Revised final: August, 2014; Accepted: September, 2014; Published in final edited form: May, 2018

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