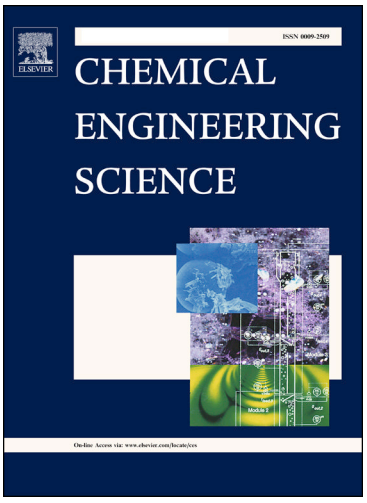

Solid-liquid suspension of microcarriers in stirred tank bioreactor - Experimental and numerical analysis

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Solid-liquid suspension of microcarriers in stirred tank bioreactor - Experimental and numerical analysis.

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Abstract

Solid-liquid suspensions in stirred tank reactors are common operations in many processes, including bioprocesses such as animal or stem cell cultures. These cells are often anchorage-dependent, i.e. they need to adhere to a surface to grow. Typically, they are cultivated on the surface of small spherical microbeads, the so-called microcarriers, suspended in stirred-tank bioreactors.

As far as we know, no extensive experimental characterization, and thus no validated simulation approach, of microcarrier suspensions in stirred-tank reactor exists in the literature. Therefore, the first aim of this work is to develop an experimental technique based on light attenuation to characterize the spatial distribution of particle concentration for various particle suspension states. The second aim is to determine the validity of Euler-Euler CFD simulations to predict the spatial distribution of low density particles, such as microcarriers, in a stirred tank bioreactor.

Experiments and simulations were performed in a small hemispherical bottom bioreactor stirred with a down-pumping axial impeller. The particles used were Cytodex-1 microcarriers ($d_P = 162$ μm and $\rho_S = 1020$ kg m^{-3}) at a solid concentra-