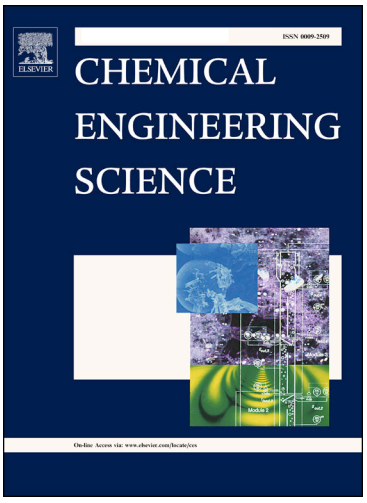

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Comparison of hydrodynamics in standard stainless steel and single-use bioreactors by means of an Euler-Lagrange approach.

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Abstract

In recent years, single-use bioreactors have been increasingly used in the pharmaceutical industry. However, no direct comparison between single-use and resuable bioreactors have been done at industrial scale.

So, the aim of this work is to critically compare hydrodynamics in a Cultibag STR (SUB) and a reusable bioreactor (SSB). The operating conditions and comparison criteria have been chosen in relation to adherent cell cultures.

The flow structure and the spatial distribution of mechanical stress were characterized using CFD. A CFD-based compartment model was used to compare mixing and, finally, the trajectories of several particles was simulated with a stochastic model to obtain circulation and residence time distributions in zones of high mechanical stress. Significant differences in terms of hydrodynamics are observed between the two bioreactors. Because of the absence of baffles, the flow in the single-use bioreactor is highly tangential compared to the SSB. As a consequence, the mixing time in the SUB is 2.5 times longer.

In the case of adherent animal cell cultures, mechanical stress is usually considered as the main limiting factor related to hydrodynamics. So, the spatial and temporal