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Modeling of the volatile organic compounds biodegradation process in the trickle-bed bioreactor—Analysis of the model parametric sensitivity

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Mathematical models of the process of air purification from hydrophobic (styrene) or hydrophilic (vinyl acetate, VA) compounds carried out in a co-current trickle-bed bioreactor (TBB) were presented. These models were marked as TSM (two-substrate model), OSM (one-substrate model) and AOSM (approximate one-substrate model). The experimental database was exploited to validate the two-substrate model (TSM) which approximated very well the experimental data; the mean percentage error of RE prediction did not exceed 3% for styrene and 4.1% for VA. For the tested systems, TSM was only sensitive to the changes in biomass dry density X_b and effective diffusion coefficient $D_{j,ef}$ values. The percentage relative error of the state variable computed using OSM/AOSM in relation to the value obtained from TSM was the quantitative criterion for comparison of the results obtained using different mathematical models of the process. It was shown that the simplified models describe the process investigated with satisfactory accuracy.

Metryczka

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