

## Supporting Information

**Figure SI-1** Schematic of the experimental bioreactor set-up. The bioreactors were operated either in a unidirectional mode or in a directionally-switching (DS) mode in which the airflow direction was reversed periodically by switching the inlet and outlet valves. The gas samples were collected from gas sampling ports located at 0, 0.25, 0.5, 0.75 and 1 m along the bioreactor column. Biofilm samples were collected from packing media sampling ports located at 0.08, 0.33, 0.67 and 0.92 m along the column.

**Figure SI-2** Variation of SSE as a function of yield coefficient and maximum biomass density. The other model parameters presented in Table 2 were used for these model simulations.

**Figure SI-3** Sensitivity of the model to estimated model parameters. The nominal values of the parameters are listed in Table 2.

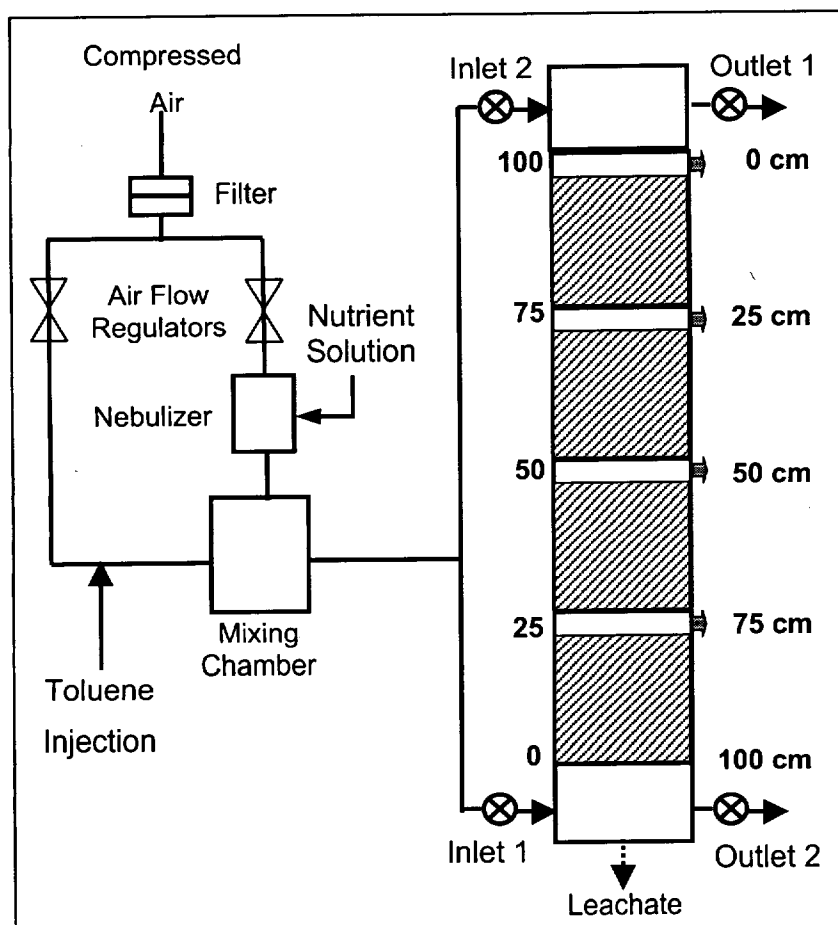


Figure SI-1

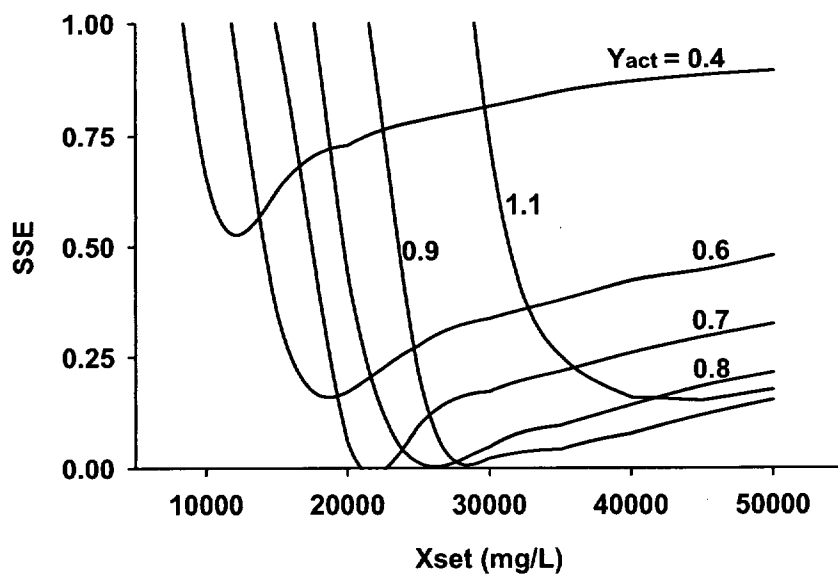


Figure SI-2

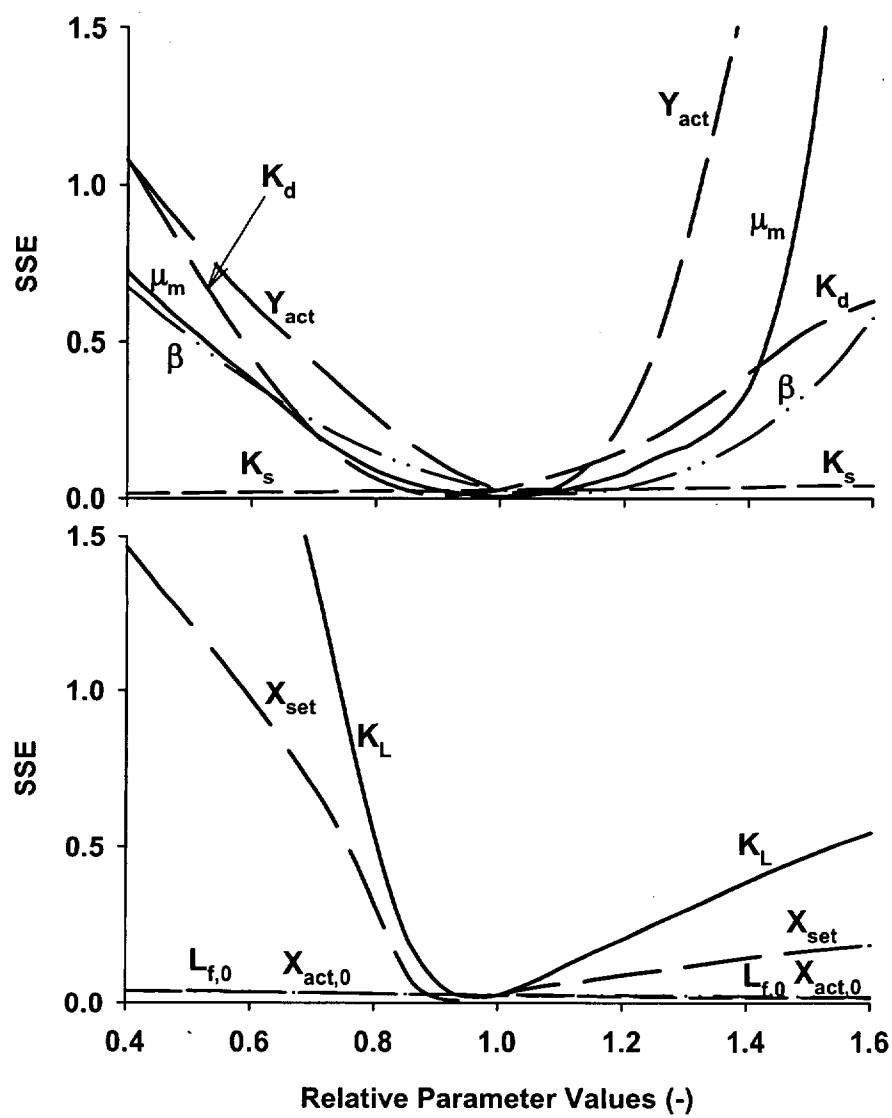


Figure SI-3