**Dynamic model for a batch process (computational experiment):**

where is biomass concentration (g L-1), is nitrate (substrate) concentration (mg L-1), is culture lutein (product) production (mg L-1), is nitrate influent flow rate (L h-1), is nitrate influent concentration (mg L-1), is incident light intensity.

Table 1: Parameters in the current model

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Value | Parameter | Value |
| [h-1] | 0.0152 | [μmol m-2 s-1] | 142.8 |
| [h-1] | 8.9510-3 | [L g-1 h-1] | 0.0106 |
| [mg L-1] | 30.0 | [mg g-1] | 2.304 |
| [mg g-1] | 305.0 |  |  |

Table 2: Operation conditions of the two sets of experiments

|  |  |
| --- | --- |
| Operation conditions | Range |
| Initial Biomass concentration, g L-1 | 0.2 |
| Initial nitrate concentration, mg L-1 | 100-800 |
| Initial lutein concentration, mM | 0.0 |
| Incident light intensity, μmol m-2 s-1 | 150-600 |
| Operational time, h | 300 |

Nitrate molar weight: 85 g mol-1, data is collected from experiments once per 12 hours.