

**Figure S13D slice trend of dispersed phase.**

The dispersed phase mixture of CO2 and N2 is plotted at 24 h and for incident light intensitiy, *Iinc*, equal to 300 µmol photons m-2 s-1



**Figure S2**

|  |  |  |
| --- | --- | --- |
| **Equation** | **Domain** | **Mathematical model** |
|  | 3-4-6-7 | MASS TRANSFER |
|  | 3-4-6-7 |
|  | 3-4-6-7 |
|  | 3-4-6-7 | FLUID-DYNAMICS |
|  | 3-4-6-7 |
|  | 4-6-7 |
|  | 4-6-7 |
|  | 4-6-7 |
|  | 4-6-7 |
|  | 4-6-7 |
|  | 4-6-7 |
|  | 3-4-6-7 |
|  | 3-4-6-7 |
|  | 3-4-6-7 |
|  | 3-4-6-7 |
|  | 3-4-6-7 |
|  | 3-4-6-7 |
|  | 3-4-6-7 |
|  | 3-4-6-7 |
|  | 3-4-6-7 |
|  | 3-4-6-7 |
|  | all | HEAT TRANSFER WITH RADIATION |
|  | all |
|  | 3-4-6-7-8 |
|  | 3-4-6-7-8 |
|  | 3-4-6-7-8 |
|  | 3-4-6-7-8 |
|  | 3-4-6-7-8 |
|  + | 3-4-6-7-8 |
|  | 3-4-6-7-8 |
|  | 3-4-6-7-8 |
|  | 3-4-6-7-8 |
|  | 6-7 | GROWTH KINETICS |
|  | 6-7 |
|  |  |

**Table S1**

|  |  |
| --- | --- |
| **Light intensity****(µmol photons m-2 s-1)** | **OD680/OD720** |
|   |   |   |
| 50 | 1.774 ± 0.002 |   |
| 200 | 1.548 ± 0.042 |   |
| 300 | 1.518 ± 0.009 |   |
| 500 | 1.496 ± 0.022 |   |
| 800 | 1.475 ± 0.010 |   |
| 950 | 1.545 ± 0.035 |   |
| 1460 | 1.597 ± 0.041 |   |
| 200\* | 1.557 ± 0.017 |   |
|   |   |   |
|  |  |  |  |

**Table S2**

|  |  |  |
| --- | --- | --- |
| Domain | Element size | [m] |
| Reator | Height  | 0.1983 |
| Width  | 0.11 |
| Thickness  | 0.024 |
| Sparger | Diameter of inlet | 0.002 |
| Diameter of holes | 0.0004 |
| Number of holes | 7 |
| Lenght  | 0.03 |
| Anchor  | Diameter | 0.006 |
| Lenght | 0.035 |
| Vessel  | Thickness  | 0.0033 |

**Table S3**

|  |  |  |
| --- | --- | --- |
|  | Gas phase | Liquid phase |
| Inlet velocity | 150 ml/min | 0 |
| Outlet pressure | Gas outlet condition | Patm, no out |
| Gravity force |  g=(9.81)ms-2 g=(9.81)ms-2 |
| Wall conditions | No gas flux at the reactor boundary;sparger non-slip model | Wall functions |
| Incident light intensity | 50/200/300/500/800/950/1460 µmol photons m-2s-1 |

**Table S4**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Iin | Iout | Iads  | Iads | Vol | mu |  |  | efficiency |
| mmol photons m-2s-1 | mmol photons m-2s-1 | mmol photons m-2s-1 | mol m-3h-1 | L | h-1 | gDW L-1 | mol photons g DW-1 | gDW mol photons-1 |
| 50 | 31.75 | 18.25 | 2.74 | 0.38 | 0.05 | 0.15 | 0.37 | 2.70 |
| 200 | 140.20 | 59.80 | 8.97 | 0.38 | 0.11 | 0.14 | 0.61 | 1.64 |
| 300 | 219.00 | 81.00 | 12.15 | 0.38 | 0.12 | 0.15 | 0.75 | 1.33 |
| 500 | 386.40 | 113.60 | 17.04 | 0.38 | 0.11 | 0.15 | 1.11 | 0.90 |
| 800 | 631.55 | 168.45 | 25.27 | 0.38 | 0.10 | 0.15 | 1.68 | 0.60 |
| 950 | 770.45 | 179.55 | 26.94 | 0.38 | 0.09 | 0.15 | 2.11 | 0.48 |

**Table S5**