

Production of bioethanol using *Chlorella vulgaris* cake: A techno-economic and environmental assessment in the Colombian context

Supporting Information

Table 1. Starch content in percent for commercial algae with potential use as a feedstock for ethanol production ^{1,2}.

Algae	% Starch extracted from algae (Dry basis)
<i>Saccharina latissima</i>	Approx. 50
Green alga NKG 121701	>50
<i>Chlamydomonas reinhardtii</i> UTEX 90	53.0
<i>C. reinhardtii</i> UTEX2247	45
<i>Chlorella vulgaris</i>	12-37
<i>Chlorococcum</i> sp. TISTR8583	26
<i>Scenedesmus</i> sp. TISTR 8579	20.4
<i>S. acutus</i> TISTR 8447	18.6
<i>S. obliquus</i> TISTR 8522	23.7
<i>Nostoc</i> sp. TISTR 887	30.7
<i>Nostoc</i> sp. TISTR 8873	32.9
<i>N. maculiforme</i> TISTR 8406	30.1
<i>N. muscorum</i> TISTR 8871	33.5
<i>N. paludosum</i> TISTR 8978	32.1
<i>Oscillatoria</i> sp. TISTR 8869	19.3
<i>Phormidium angustissimum</i> TISTR 8979	28.5
<i>Spirulina fusiformis</i>	37.3-56.1

Table 2. Cost indexes of heat exchange network for the production of bioethanol using the *C. vulgaris* cake: Molecular Sieves.

Network Cost	Scenario 1	Scenario 2
Item	USD/s	USD/s
Heating	1.030e-2	9.875e-3
Cooling	3.111e-4	1.008e-3
Operating	1.061e-2	1.088e-2
Total	1.324e-2	1.222e-2
<i>Capital (USD)</i>	<i>2.574e5</i>	<i>1.311e5</i>

Table 3. Cost indexes of heat exchange network for the production of bioethanol using the *C. vulgaris* cake: Extractive distillation.

Network Cost	Scenario 1	Scenario 2
Item	USD/s	USD/s
Heating	1.256e-2	1.107e-2
Cooling	1.340e-3	1.089e-3
Operating	1.390e-2	1.216e-2
Total	1.764e-2	1.456e-2
<i>Capital (USD)</i>	<i>3.664e5</i>	<i>2.349e5</i>

Literature cited

1. Rojan, P. J.; Anisha, G. S.; Nampoothiri, K. M.; Pandey, A., Micro and macroalgal biomass: a renewable source for bioethanol. *Bioresource technology* **2011**, 102, (1), 186-193.
2. Chen, C.-Y.; Zhao, X.-Q.; Yen, H.-W.; Ho, S.-H.; Cheng, C.-L.; Lee, D.-J.; Bai, F.-W.; Chang, J.-S., Microalgae-based carbohydrates for biofuel production. *Biochemical engineering journal*, (0).