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## Methane Production From Lipid Extracted

Abstract. A two-stage process to produce hydrogen and methane from lipid-extracted microalgal biomass residues (LMBRs) was developed. The biogas production and energy efficiency were compared between one- and two-stage processes. The two-stage process generated  $46 \pm 2.4$  mL H<sub>2</sub> /g-volatile solid (VS), and 393.6

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± 19.5 mL CH<sub>4</sub> /g-VS.

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Hydrogen and methane production from lipid-extracted ...  
Methane production from lipid-extracted algal residues . Yan Li.  
a,b, Dongliang Hua. a,b, Jie Zhang. a,b, Yuxiao Zhao. a,b, Hui Mu.  
a,b, Haipeng Xu. a,b, Xiaohui Liang. a,b ... methane production  
potential of algal residues was conducted in this paper. The effect of  
inoculum to substrate ratios (ISRs) on the methane production by  
anaerobic ...

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Methane production from lipid-extracted algal residues  
The energy yield from algal biomass through conversion of lipid

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into biodiesel (BD), whole algae AD into methane (CH<sub>4</sub>) and combined production of BD (from lipids) and CH<sub>4</sub> (from LEA) for three scenarios: “Theor. max.” – the theoretical maxima of energy production; “Basic” – conversion into BD only neutral lipids and CH<sub>4</sub> yield as determined for untreated biomass; and “Improved” – accounts for enhancing in CH<sub>4</sub> yield due to pretreatment.

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Prospects for methane production and nutrient recycling ...

A two-stage process to produce hydrogen and methane from lipid-extracted microalgal biomass residues (LMBRs) was developed. The biogas production and energy efficiency were compared between one-...

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Hydrogen and methane production from lipid-extracted ...

A two-stage process to produce hydrogen and methane from lipid-extracted microalgal biomass residues (LMBRs) was developed. The biogas production and energy efficiency were compared between one- and two-stage processes. The two-stage process generated 46 +/- 2.4 mL H<sub>2</sub>/g-volatile solid (VS), and 393.6 +/- 19.5 mL CH<sub>4</sub>/g-VS.

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Hydrogen and methane production from lipid-extracted ...

The extracted oil composition was analyzed (saturated, monounsaturated and polyunsaturated fatty acids) and quantified. The highest lipid yields were obtained from *Tetraselmis* sp. (11%)

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and *Scenedesmus almeriensis* (10%), while the highest methane production from the lipid-exhausted algae biomass corresponded to *Tetraselmis* sp. (236 mL CH<sub>4</sub> /g VS added).

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Biofuels from microalgae: Lipid extraction and methane ...

In the case of ultrasonic pretreatment, the methane production was between 168 and 208 NmL CH<sub>4</sub>/g VS for *C. vulgaris*, while for *B. braunii* ranging from 150 to 174 NmL CH<sub>4</sub>/g VS. Anaerobic digestion showed that lipid-extracted biomass presented lower methane yield than non-lipid-extracted feedstock, and higher amount of lipid obtained in the extraction contributed less methane production.



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[link.springer.com](http://link.springer.com)

This study presents experimental measurements of the biochemical methane production for whole and lipid extracted *Nannochloropsis salina*. Results show whole microalgae produced 430 cm<sup>3</sup> CH<sub>4</sub> g<sup>-1</sup> volatile solids (VS) (60), 3 times more methane than was produced by the LEA, 140 cm<sup>3</sup> CH<sub>4</sub> g<sup>-1</sup> VS (30). Results illustrate current anaerobic modeling efforts in microalgae to biofuel assessments are not reflecting the impact of lipid removal.

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Microalgae to biofuels: Life cycle impacts of methane ...

SMP for suitably extracted biomass ranged from 0.30 to 0.38 L CH<sub>4</sub> /g VS (volatile solids). For both whole and lipid-extracted

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biomass, overall organic conversion ranged from 59.33 to 78.50 as a measure of % VS reduction with greater percentage biodegradability in general found within the lipid-extracted biomass.

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Efficient anaerobic digestion of whole microalgae and ...

On the basis of actual CH<sub>4</sub> production, a recoverable energy of 8.7–10.5 MJ kg<sup>-1</sup> of dry microalgae biomass residue was obtained using the lipid extracted and transesterified microalgae samples. On codigesting the microalgae residues with glycerol, a 4–7% increase in CH<sub>4</sub> production was observed.

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Energy recovery from lipid extracted, transesterified and ...

The proposed lipid extraction method coupled with biogas production from lipid-spent microalgae addresses several issues that might reduce biodiesel production costs. It has been estimated that up to 33% of savings can be achieved when the electricity generated from methane is able to power the microalgal biodiesel production system ( Harun et al., 2011 ).

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Impact of osmotic shock pre-treatment on microalgae lipid ...

Sustainable mass production of algal biofuels requires a reduction in nutrient demand and efficient conversion into fuels of all biomass including lip...

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Prospects for methane production and nutrient recycling ...

Lipids were obtained by supercritical CO<sub>2</sub> extraction (SCCO<sub>2</sub>), while anaerobic digestion of the lipid-exhausted algae biomass was used for biogas production. The extracted oil composition was analyzed (saturated, monounsaturated and polyunsaturated fatty acids) and quantified. The highest lipid yields were obtained from *Tetraselmis* sp. (11%) and ...

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Biofuels from microalgae: lipid extraction and methane ...

Correspondingly, the maximum methane production rate was found to increase from 23.11 to 33.14 ml/g VS/day, and the lag time was noted to increase from 0.83 to 3.61 days when the inoculum ratio of

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*C. thermocellum* was increased from 0% to 10%.

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Bacterial bioaugmentation for improving methane and ...

Sustainable mass production of algal biofuels requires a reduction in nutrient demand and efficient conversion into fuels of all biomass including lipid-extracted algal residues (LEA). This study evaluated methane production, nutrient recovery and recycling from untreated and enzymatically pretreated *Nannochloropsis* LEA using semi-continuous anaerobic digestion (AD).

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Prospects for methane production and nutrient recycling ...

This study presents experimental measurements of the biochemical

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methane production for whole and lipid extracted *Nannochloropsis salina*. Results show whole microalgae produced 430 cm<sup>3</sup>-CH<sub>4</sub> g-volatile solids<sup>-1</sup> (g-VS) (?=60), 3 times more methane than was produced by the LEA, 140 cm<sup>3</sup>-CH<sub>4</sub> g-VS<sup>-1</sup> (?=30).

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Microalgae to biofuels: life cycle impacts of methane ...

Effect of chloroform on (a) the cumulative CH<sub>4</sub> production and (b) total organic acids production and its distributions in anaerobic digestion of lipid extracted microalgae. Table 2 . Experimental results on CH<sub>4</sub> production of lipid-extracted microalgae at various chloroform concentrations.

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Inhibitory effect of chloroform on fermentative hydrogen ...

In this study, AD of food waste (FW) was optimized by removing lipids (LRFW) and by co-digestion with sewage sludge (1:1 w/w on dry matter). The results obtained showed that lipids extraction increased FW methane yield from 400 to 418 mL-g VSadded<sup>-1</sup> under mesophilic conditions (35 °C) and from 426 to 531 mL-g VSadded<sup>-1</sup> in thermophilic conditions (55 °C).

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