

HU-ACE NEWS LETTER

Advanced Core for Energetics, Hiroshima University

Vol. 24
2018.12**Activities of the Core**

- | | |
|----------------|--|
| Dec. 1-3, 2018 | Joint Conference in Renewable Energy and Nanotechnology (JCREN) 2018 |
| Dec. 6, 2018 | The 70 th Hiroshima University Biomass Evening Seminar (co-organization) |
| Dec. 6, 2018 | The 105th Mechanical System Seminar (Workshop on Collaboration between Universitas Sriwijaya and Hiroshima University) |
| Dec. 19, 2018 | Hydrogen Symposium 「Hydrogen Local consumption and Business Model」 |
| Dec. 27, 2018 | The 27th HU-ACE Steering Committee Meeting |

Joint Conference in Renewable Energy and Nanotechnology (JCREN) 2018

We co-organized the 7th Joint Conference in Renewable Energy and Nanotechnology (JCREN2018) on Dec. 1-3 in Ube, Japan. This is the conference where presentations on nanotechnology and renewable energy are made in the same place. The chair was Prof. Tanoue, Yamaguchi University, and 80 participants mainly from Asian countries joined. After the active discussion on the first day, we visited Ube Insustry on the second day as a part of technical tour.

Presentation given by Mr. Apip Amrullah from HU-ACE received the Best Presentation Award. The next JCREN will be held on Nov. 5-7, 2019 in Makassar, Indonesia.



Issued by Advanced Core for Energetics, Hiroshima University

HU-ACE Secretariat, Research Planning Office, Hiroshima University,
1-3-2 Kagamiyama, Higashi-Hiroshima, 739-8511 Japan
<http://home.hiroshima-u.ac.jp/hu-ace/en/>

Research Topics

Bioconversion of Volatile Fatty Acids into Biodiesel Fuel by Marine Bacterium

Yoshiko Okamura

Associate professor, Department of Molecular Biotechnology, Grad School of Advanced Sciences of Matter, Hiroshima University

Research field: Engineering/ Biotechnology / Genomic engineering

Keyword: Marine Biotechnology, Biomineralization, Metagenome, Biomass, Biodiesel Fuel



Abstract

Background *Nitratireductor* sp. strain OM-1 (Fig. 1), which can convert volatile fatty acids (VFAs) into biodiesel fuel (BDF), was isolated to be utilized for wastewater treatment. Conventional method of wastewater treatment produces the excess sludge and cost problems. Thus, we have screened the bacterium which can achieve the methods of effective-utilization of wastewater, BDF production and sludge reduction¹⁾.

Methods 1) Evaluation of the abilities of wastewater treatment and oil production by strain OM-1 using actual methane fermentation residues.

2) Optimization conditions for the highest oil production by strain OM-1 and evaluation of its oil contents, oil yields, oil components and combustion calorimetry.

Results 1) Total VFAs of 922mg/L remaining in actual methane fermentation residues were completely consumed by strain OM-1. Moreover, initial chemical oxygen demand (COD) was reduced to 91% and 40% of excess sludge was successfully reduced. However, oil production in strain OM-1 was inhibited by remaining ammonium. In addition, interestingly, co-culture of OM-1 and bacterial consortium was able to reduce COD and excess sludge more than mono-culture.²⁾

2) Strain OM-1 accumulated oils by 30-70% of dry cell weight under the nitrogen-depleted conditions and its oil composition and quantity depend on the kind of VFAs (Fig. 2). Under the optimum conditions, oil content and oil yield were 91% and 1 g/L, respectively. Moreover, 50% of total oil was ester. It is very interesting that ester was directly converted from short-chain fatty acid. Furthermore, the combustion energy of the dried cells was 23.8 kJ/g, suggesting that the combustion energy of OM-1's ester was estimated as about 50 kJ/g.

In the next study, biomass will be converted into BDF via VFAs using strain OM-1 and acidogenetic bacteria.

Reference 1) Okamura et al. *Bioresource Technology*, 201, 215-221, (2016)

2) Okamura et al. *Papers of the 26th European Biomass Conference*, 917-920. (2018)

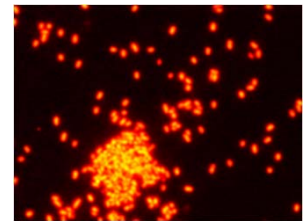


Fig. 1 *Nitratireductor* sp. strain OM-1 stained by Nile-red.

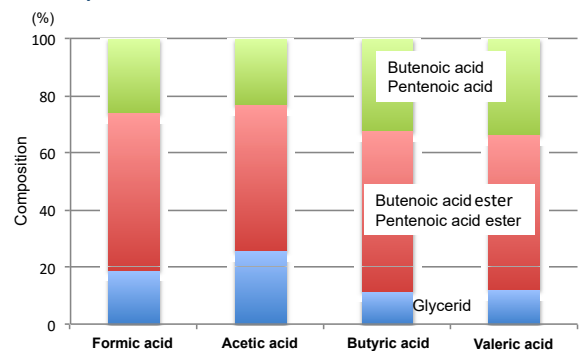


Fig. 2 Oil composition when cultivated with different VFAs