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## Energy balance of oil recovery process using liquefied dimethyl ether

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An energy-efficient and low-cost process for recovering oil from microalgae is needed for the production of algal biofuels. Here, CRIEPI and JX investigate a novel hybrid oil recovery method using dimethyl ether (DME) and hexane (DH method) from algae. Moreover, to evaluate the energy consumption of the DH method, CRIEPI and JX made a conceptual design of a practical plant using DH method. In the DH method, wet *Euglena gracilis* cells were placed into a vessel, mixed with liquefied DME, and shaken at room temperature (20°C). After 5 min of shaking, wet *E. gracilis* cells were mixed with hexane and shaken at 20°C for 5 min. After evaporating DME, the hexane layer was separated from the water layer. Approximately 80% of the total oil was recovered in the hexane layer when the DME: hexane: wet algae ratio was 12:4:1. Based on the lab-scale experiments, the total operational energy of this DH method was estimated to be about 27.1 MJ per kg oil. Compared with the conventional oil extraction process from dry algae, this process offers significant advantages for oil recovery. However, approximately 76% of the total energy was consumed by the compressor during DME condensation. Therefore, the reduction of the DME consumption is key technology for successful operation of the DH method.

### Biography

Kiyoshi Sakuragi was born in Shizuoka, Japan, in 1986. He received his B.E. and M.Tech. Degrees in Forest Chemistry from the University of Tokyo, Japan, in 2009 and 2011, respectively, and he is a doctoral student at the University of Tokyo, Japan, from 2015. In 2011, he joined Central Research Institute of Electric Power Industry as a research associate. His current research interests include biomass utilization in bio-oil production, carbonization, and enzymatic saccharification.

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