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著者(和文)	BOONYUBOLSasipa
Author(English)	Sasipa Boonyubol
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（博士課程）
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論 文 要 約

THESIS OUTLINE

専攻： Department of	Chemical Science and Engineering	専攻	申請学位（専攻分野）： Academic Degree Requested	博士 Doctor of	（Engineering）
学生氏名： Student's Name	Sasipa Boonyubol		指導教員（主）： Academic Advisor(main)	Hidetoshi Sekiguchi	
			指導教員（副）： Academic Advisor(sub)		

要約
Thesis Outline

The objective of this work is to study the effects of additional solid particles under ultrasonic irradiation on the lipid extraction and the biodiesel production from microalgae.

Chapter 1: Introduction: The background of biodiesel, as well as its production method (transesterification), was briefly explained. The use of microalgae as a potential source of biodiesel was introduced. The process of the lipid extraction and the transesterification from microalgae was briefly explained. The applications of ultrasonic irradiation and the addition of solid particles with various processes were described. Based on the background, the use of the additional solid particles under ultrasonic irradiation on the lipid extraction and the biodiesel production from microalgae was proposed.

Chapter 2: Effect of alumina particles under ultrasonic irradiation: The effect of alumina particles on the simultaneous process of the lipid extraction and the biodiesel production was investigated. Chlorella was used as a model of microalgae. Three experimental variables were studied, including ultrasonic power, catalyst concentration, and reaction time. Alumina was selected as a solid particle to add in the process. The two-step process of the lipid extraction followed by the biodiesel production was performed to investigate and clarify the effect of alumina particles under ultrasonic irradiation on FAME conversion. The results indicated that both the processes were accelerated by the addition of alumina particles. The effect was more remarkable on the transesterification than on the lipid extraction.

Chapter 3: Variation of solid particles: The variations of the solid particles were conducted including, the number of the particles, the size of the particles, and the type of the particles. The results indicated that a higher number of the particles and larger size of the particles tended to give higher FAME conversion. Among four types of the particles, zirconia gave the highest FAME conversion when the same number and size of the particles were applied. The two-step process was also performed with three types of the particles. All the three types showed the same result that the solid particles showed high enhancement on the transesterification with slight enhancement at the lipid extraction step.

Chapter 4: Mechanism: The effects of each parameter from the variations of the solid particles were verified. Several factors that had an impact on FAME conversion, including, surface area, movement index, and acoustic impedance, were explained. The large surface area would contribute to high interaction between the solid particles and ultrasonic irradiation that could create more microjets and cavitation bubbles, resulting in the enhancement of the process. The large difference of the acoustic impedance between two media could lead to more energy reflection which caused high movement of the particles. By reviewing the phenomena governing the lipid extraction and the transesterification obtained in the experiments, the overall enhancement mechanism by the additional solid particles under ultrasonic irradiation on the process was illustrated.

Chapter 5: Conclusion: The findings obtained from this study were summarized and future prospects were suggested. The additional solid particles under ultrasonic irradiation were proven to be effective on the lipid extraction and the biodiesel production from microalgae.