Fermentation of Lactic Acid from Sea Algae Cultivated in Tokyo Bay to Produce Bioethanol

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Biomass is a great tool to obtain alternative energy source. Fermentative technology is the most usable measure to produce bio-energy source both of bio-ethanol and bio-hydrogen. Various type of developing technology has been greatly promoted in these area s these days. And much edible plant has been used as the substrate for fermentation. These trends have boosted up the price of grain very rapidly and many people suffered and annoyed for the rapid price rise of corn and wheat, and related products. In attempt to alternative type of recyclable carbon source, we have been applied sea algae for biomass process. Non edible plant, like chipped timber and even bamboo has been tested to gain effective source of fermentation process. Because of the inability of microorganisms such as *Saccharomyces cerevisiae* and *Lactobacillus* we are in need of some type of process for efficient conversion of glucose to bio-ethanol. The major technology for this fermentation process, we used the fine tuned cellulose fixed pre-treatment in bioreactor.

Based on the situation, our research team has been focused on sea plant area to use these sea algae as the recycle carbon source. As Japan has a short of field of planting area, on the contrary, we occupy the long sea coast area which is attractive plant field to produce recyclable carbon source.

Our plan to cultivate sea algae alongside of vast Japanese sea coast and in addition to that these sea plant has effectiveness to absorb more CO_2 gas from atmospheric phase.
The idea drives us to sea algae to use effective source for preservation the earth CO_2 balance and suitable society to keep native friendly society.

In this session, we are going to report how we can use bio-science technology, and cutting edge biotechnology into sustainable safety technology to keep our nature friendly society. At first, we set the plan to cultivate sea algae, which is most popular in Japan, *Laniaries japonica*, these algae is fast to grow and absorb much of CO_2 in rapid cycle. In the corporation with fishery organization in Minamiboso City to cultivate algae in new type of sea algae bed to promote fast grow of these algae, we named these construction, as Moba construction in Japanese.

In September 2008, we cultivated and yield the algae and dried up in our laboratory, and the were prepared for the second phase as fermentation process.

We plan to use the microorganisms for fermentation process. Our strain, in combination with *Saccharomycess cerevisiae*, and Photosynthetic bacteria, *Rhodobacter sphaeroides*. These strains enable us to direct process to ferment these algae resource. For the degradation of algae,

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海藻スラリーの乳酸発酵

神野 英毅、山崎 博司、掘田 健治

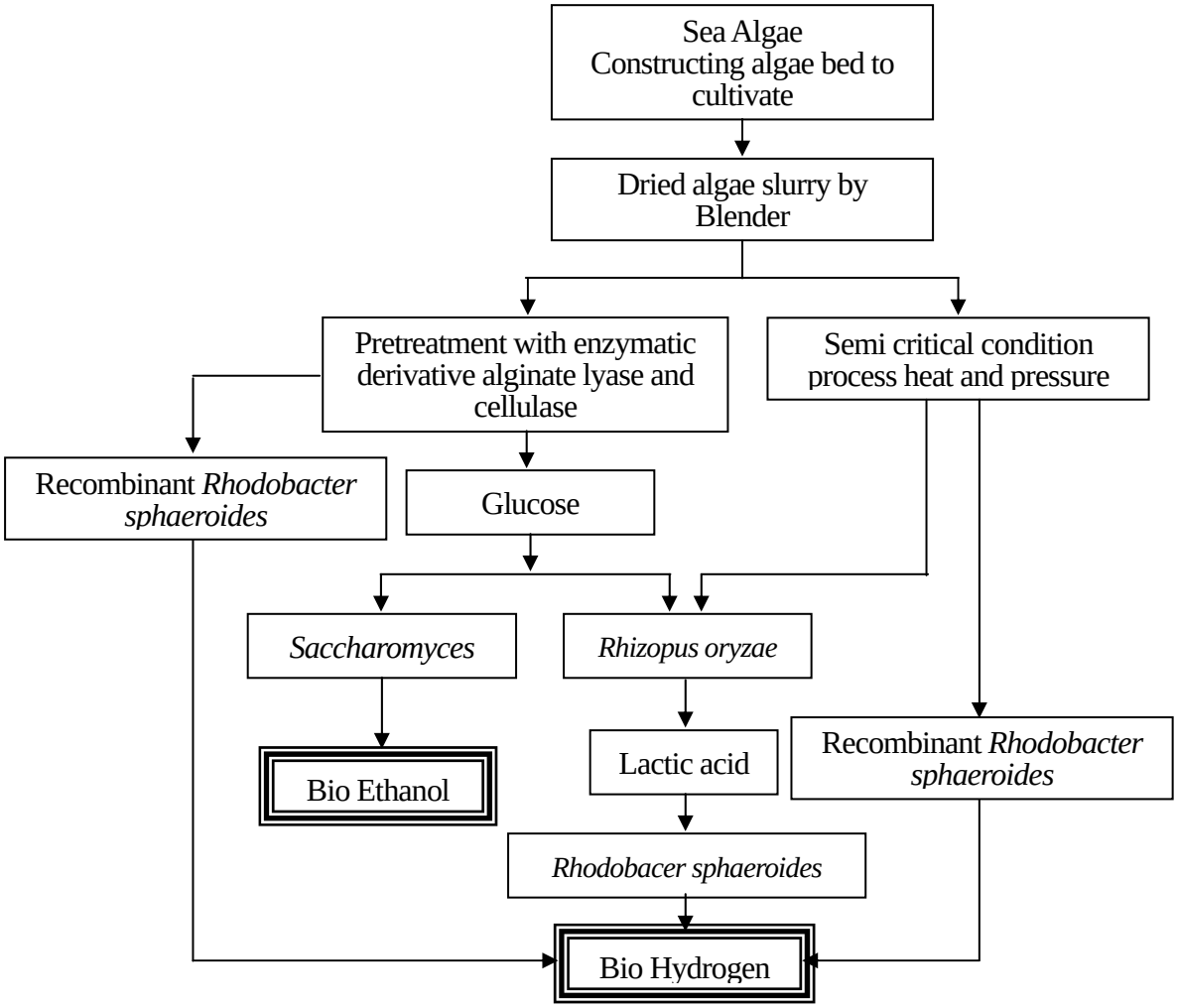

Fig. 1 Experimental Chart of Fermentation Process [1)]

we tested semi-critical condition treatment that led these algae to lactic acid, which is most usable key substance to provide bio-energy source. The process was carried out by Dr. Nakagawa, which is presented briefly here in this session.

The alternative way to use biodegradation, we use used *cellulase* to convert the algae in to glucose. In these session we compared the cost performance of semi-critical condition treatment with fermentation in heat balance. For the fermentation of sea algae, we analyzed the chemical composition of sea plant. The result is alginic acid, cellulose, and rest of them as ash, these proportion is 4:4:2. Based on the data, to degrade the algae we used at first step, alginate lyase. The process loosens the tightness of plant structure and glucose moiety is appeared on the surface.

Our approach to set up industrial process of biomass alternative energy source, we provided many type of biomass technology. For the pretreatment of *Laminaria japonica*, we used alginate lyase to exclude alginic moiety and cellulase treatment that let three processes into lactic acid. As the chemical for bio fermentation lactic acid is our key compound to produce future bio energy source. The following is our scheme to produce sustainable low car society in biomass.

Reference

1)Handbook of Bioethanol edited by C.Wyman ;CRC Press 1996