Creation of High Value-Added Materials from Plant Biomass

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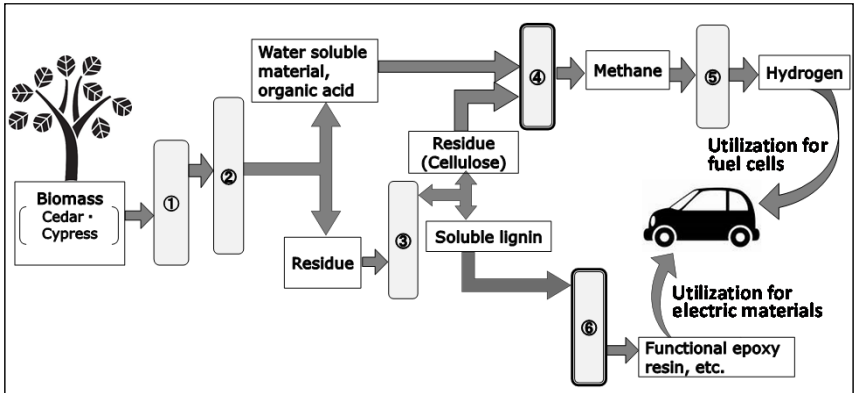

Fig.1 Collaborative creation system of hydrogen and resin from plant biomass. ① Steam explosion, ② Water extraction, ③ Acetone extraction, ④ Methane fermentation, ⑤ Steam reforming, ⑥ Resinification.

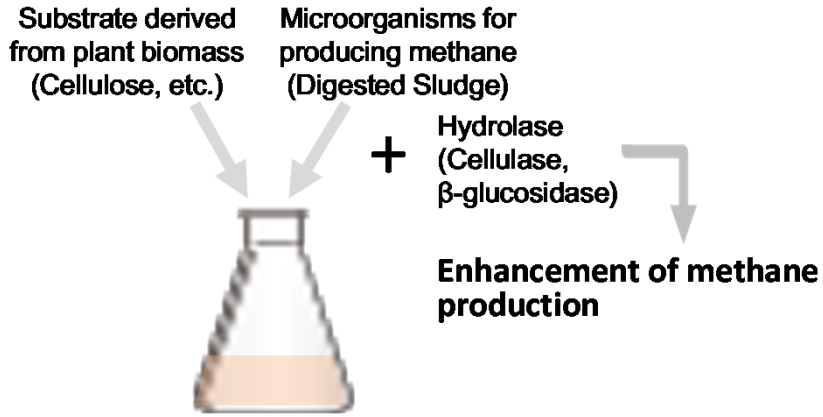

Fig.2 Utilization of cellulose-degrading enzyme that is produced in large quantities by recombinant *E. coli*.

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To develop alternative material of oil substitute has been requested until present while increasing since an oil crisis. It is over 30 years since the second oil crisis that a biomass fuel attracts attention, but it is hard to say the energy from using biomass is effective for CO_2 reduction, and suitable for reality use of industrial system.

In Japanese mountain, a large quantities of softwood (cedar or cypress) has left unused and unattended. Because softwood material is difficult to pretreat for de-lignification more than other biomass due to the strong lignin network structure of softwood, we attempted to use this softwood material for effective utilization.

About the energy conversion of the biomass, methane ferments to produce methane becoming the source of hydrogen which is the energy source of the fuel cell. The hydrogen production is prepared by the steam reforming method of methane included in natural gas mainly, but the use of biomethane is expected now to solve problems such as the drying up or the global warming of fossil resources. The material (cellulose and hemicellulose) are converted into methane, and the synthesis of functional epoxy resin is attempted using other component, i.e. lignin.

Keywords : methane fermentation, biomass, high temperature-resistant enzyme

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