

Development of Technologies in Biorefinery

Strategy

- The focus of our work is to develop biorefining technologies to produce fuels and chemicals from non-food cellulosic biomass.
- Our core system is an innovative bioprocess named "Growth-arrested bioprocess", which enables bio-production of fuels and other chemicals with remarkably high yields.
- Our approach is to refine microbial catalysts through genetic/metabolic engineering, exploiting cutting-edge biotechnologies.

Technology

"Biorefining" is defined as the sustainable processing of biomass into a spectrum of bio-based products and bioenergy. Over the past several years, the biorefinery concept attracts rising attention as a key strategy to reduce CO₂ emissions and establish a sustainable society.

RITE Bioprocess[®], an innovative bioprocess developed by RITE, exploits "growth-arrested" bacterial cells to convert non-food biomass to an array of bio-products, including ethanol, butanol, amino acids, lactic acid, succinic acid, and aromatic compounds such as phenol and shikimic acid. Our workforce microbe has a unique feature, namely, it retains major metabolic pathways active while its growth is arrested under anaerobic conditions. RITE Bioprocess[®] takes advantage of this feature, achieving high productivity comparable to conventional chemical processes. Furthermore, our process is the first example of bioprocesses that realized both "simultaneous utilization of C6 and C5 mixed sugars" and "high tolerance to fermentation inhibitors".

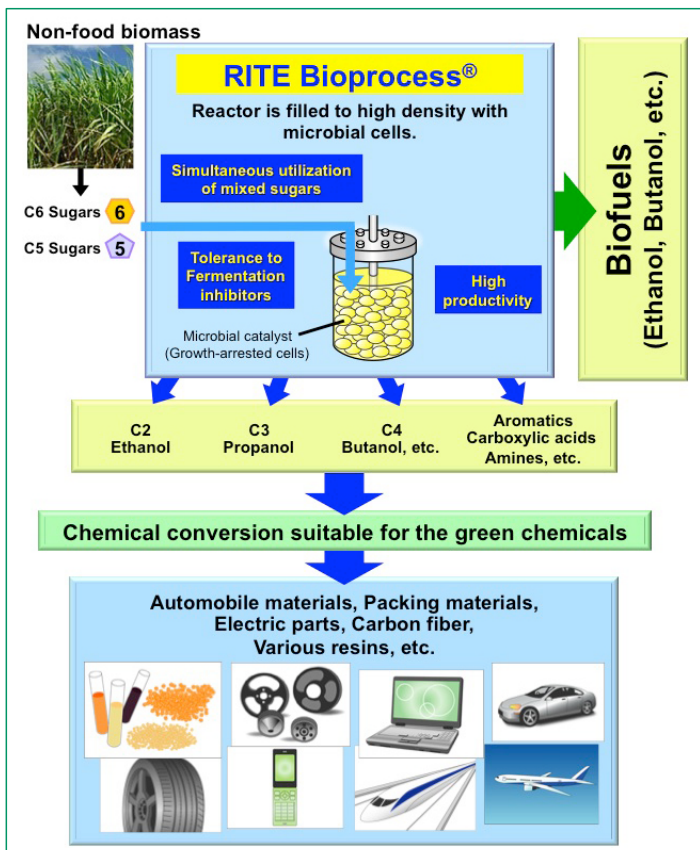


Figure 1 Concept of biorefinery

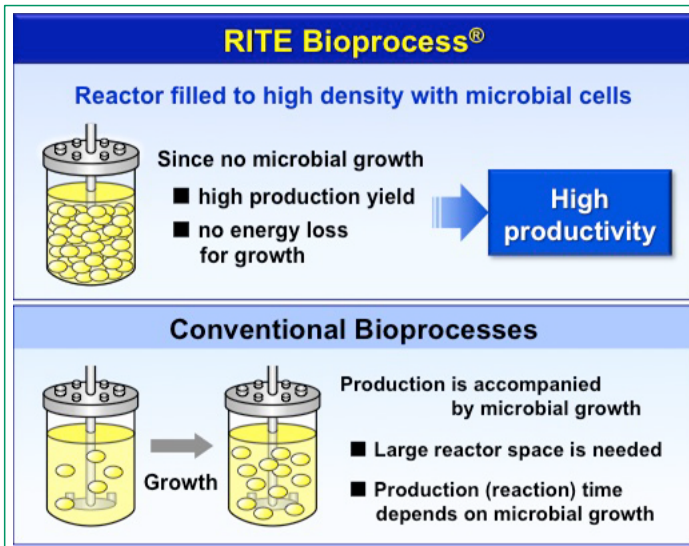


Figure 2 Features of RITE Bioprocess[®]

Commercialization

Aiming at commercialization of our technologies, RITE founded its first venture capital firm, Green Earth Institute (GEI) Co., Ltd., and more recently Green Phenol Development Co., Ltd. in collaboration with Sumitomo Bakelite Co., Ltd. Both companies produce fuels and chemicals for domestic use through RITE Bioprocess[®]. We plan to expand our business to other parts of Asia in near future.

Significance

RITE Bioprocess[®] starts from aerobic cultivation of microbial cells, which are subsequently packed into a reactor to high density. In the reactor filled with the microbial catalyst, bioconversion of biomass to fuels and chemical products proceeds under anaerobic condition, which restricts growth of the microbe. Thus, our process is more cost- and time-efficient compared to conventional fermentation processes, in which formation of products and biomass inevitably occurs in parallel. Moreover, our system is compatible with cellulosic non-food biomass, and therefore can contribute greatly to reduce CO₂ emissions.

RITE Bioprocess[®] has been highly evaluated internationally, and we won the 18th Nikkei Global Environmental Technology Awards in 2008.

Applicable field
(i) Biofuels
(ii) Chemicals

Water

Energy saving/Energy recovery

Energy storage/Energy creation

New energy

Waste disposal/
Recycling/
Resource saving

Air

Soil

Other