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Editorial

Biofuel production process by novel biocatalysts

The growing seriousness of the global energy problem and the environmental pollution are substantially increasing the importance of using value-added products from biomass resources as biofuels. Biofuels produced from biomass, such as biodiesel or ethanol, have two significant advantages:

1. biodegradability;
2. better-quality exhaust gas emissions.

In addition, the atmospheric levels of carbon and sulfur dioxide are not raised because the organic carbon of biofuels is produced by photosynthesis in plants.

In the current research on biodiesel production, rapeseed esters are being investigated in Europe, and palm oil esters in Malaysia. Soybean oil esters also feature prominently as a potential diesel fuel alternative, and there is a wide range of ongoing research in this area. In fact, in recent years biodiesel has been produced from waste edible oil on a pilot scale in Japan. Though efficient in terms of reaction yield and time, the chemical approach to synthesizing alkyl esters from triglycerides has several drawbacks, including difficulties in the recovery of glycerol, the need for removal of salt residue, and the energy-intensive nature of the process. On the other hand, the use of biocatalysts allows for the synthesis of specific alkyl esters, easy recovery of glycerol, and transesterification of glycerides with high amounts of free fatty acids. In addition, this process can further be used to synthesize other value-added products, including biodegradable lubricants and additives for fuels and lubricants.

Over the past two decades, there has been considerable interest and activity in the production of ethanol for use as a fuel by fermentation. Sugar materials, such as molasses, sugar cane and sulfite waste liquor have been mainly utilized for ethanol production, since complicated saccharifying or lignin degrading pretreatment processes are required when starch or cellulosic materials are used. Thus, there is a need for a novel bioprocess by which ethanol can be produced directly from starch or cellulosic materials without the necessity for any pretreatment.

The joint research project—Effective Biofuel Production Process by Novel Biocatalysts—which has been set up with the support of the New Energy and Industrial Technology Development Organization (NEDO) of Japan for 3 years, from 1998 to 2001, aims to establish a practical bioprocess for biofuel production. Twenty-six scientists with backgrounds in biochemical engineering, enzyme engineering, biology, chemistry and other relevant fields, working in five universities, two research institute, and four industrial companies, are participating in the research. This special issue consists of 14 papers on fundamental and applied studies on the biofuel production process by novel biocatalysts, contributed by the participating scientists, and we hope that these contents could significantly contribute to alleviating global energy and environmental problems.

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