
Development of a solid catalyst process for manufacture of biodiesel fuel

- A simple manufacturing process that does not generate waste
and also produces high-purity glycerine

Nippon Shokubai Co., Ltd. (President, Tadao Kondo) has developed a new catalyst and therewith a new process for simultaneous production of biodiesel fuel and glycerine from vegetable oils. The new process based on our new technology is a landmark and cost competitive one in that the process generates almost no waste and offers respective reductions of about 10 and 15 percent in equipment and variable costs, compared to the conventional process.

The term "biodiesel fuel" refers to fatty acid esters obtained through chemical conversion of vegetable oils (biomass) such as rapeseed oil and palm oil. Because its properties resemble those of light gas oil, which is a fossil fuel, the esters can be used as diesel fuel. This, in turn, will help to reduce emissions of carbon dioxide, a cause of global warming. For this reason, biodiesel fuel has come to the fore in recent years as a form of renewable energy. In the conventional manufacturing process applying homogeneous alkali catalysts, however, it has been difficult to remove, recover, and reuse catalysts. As a result, this process has been saddled with the following three major problems:

1. Derivation of large quantities of liquid and solid waste in operations to remove catalysts
2. Decline in yield and occurrence of product loss due to accompanying derivation of soap
3. Low grade of a by-product glycerine and need for a refining process to permit its effective use

The solid catalyst process we have developed is a clean one that generates almost no waste. It is a landmark new manufacturing method that resolves the problems with the conventional process by using insoluble solid catalysts we have independently developed. As an added advantage, it enables conversion of all sorts of vegetable oils (e.g., palm oil, soybean oil, rapeseed oil, canola oil, and coconut oil) into fatty acid esters through virtually the same procedure. This new technology applies a continuous-flow fixed-bed reactor, which does not require a catalyst removal process. It is marked by the following features.

1. Simple manufacturing process
2. Waste-free
3. High yield of a fatty acid ester (3% higher than in the conventional process)
4. High purity of a by-product glycerine (at least 98 wt%)

Notably, a by-product glycerine has a very high purity, and we anticipate that it will be able to be used as a new chemical material directly, that is, without undergoing refinement.

We are promoting development of commercial facilities based on this new technology.

Part of the research behind this development was implemented with aid from a fiscal 2004 to 2006 program for promotion of industrial technology development towards attainment of the Kyoto Protocol targets, under the Research Institute of Innovative Technology for the Earth (RITE). A small-scale pilot test of the technology has already been completed.

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