

Polyols from Sorbitol

The stabilized catalyst for aqueous phase processing, developed by researchers at Pacific Northwest National Laboratory, was licensed in May 1996 to International Polyol Chemicals, Inc. (IPCI) for use in production of polyols from glucose.

IPCI, a technology commercialization company, has formed a partnership to build a world-scale facility using their process for polyols from sugars. The plant will make chemical feedstocks from renewable farm crops at costs competitive with conventional petroleum-based methods.

For more information, contact

Douglas C. Elliott
Pacific Northwest National Laboratory
P.O. Box 999, MSIN K2-12
Richland, WA 99352
Phone: (509)375-2248
Fax: (509)372-4732
dougc.elliott@pnl.gov

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Pacific Northwest National Laboratory's work on optimizing polyol production from biomass provides improvements in catalysts and processing. Working with International Polyol Chemicals, Inc. (IPCI), researchers developed stabilized catalysts for the IPCI process that converts sugars to polyols. Polyol products (ethylene glycol, propylene glycol, glycerol, and other diols) can be produced from biomass more energy efficiently than the current production from petroleum. The ability to selectively favor the production of a specific polyol product from a platform chemical (in this case, sorbitol) is important in making this process economical in a given market environment.

Polyol production based on petroleum feedstock is inherently energy inefficient because of the oxidation process used and also is economically dependent on foreign resources. As a replacement for petroleum feedstocks, sorbitol may be produced from corn starch-based glucose and further processed into a suite of valuable polyol chemicals. The three major polyol products, the two glycols and glycerol, have a combined market of about 4 million tons per year in the U.S. alone. Some well-known commercial products include antifreezes and polyester fabrics.

Project Highlights

This project, including a Cooperative Research and Development Agreement (CRADA) with IPCI, was completed in FY 1996. Researchers at Pacific Northwest used batch and continuous-flow reactor tests to evaluate the range of optimum production of glycerol from sorbitol gained with improved nickel metal catalysts. The industrial partner subsequently instigated a major development project to utilize the process in a world-scale plant.

One U.S. patent (#5,814,112) has been issued, and a second application is pending on the stabilized nickel metal catalysts for use in this technology and other aqueous phase hydrogenation processing systems.

Continuing Association

Research is continuing at Pacific Northwest to expand the utility of the IPCI process for polyol production from renewable sugar feedstock sources. The Laboratory has signed a memorandum of understanding with IPCI to cooperate in this area. Process development is underway on hydrolysis of complex carbohydrate feedstocks produced as waste streams from corn wet milling and wheat dry milling. Basic scientific investigations are being conducted using high frequency nuclear magnetic resonance instrumentation to better define the hydrolysis kinetics of these carbohydrates. Catalytic hydrogenation studies are continuing on sugars other than glucose.