1,3-Propanediol (PDO)

BIOREFINING PROCESS SOURCE

Fermentation of 6-carbon sugars & starches, fermentation of lignocellulosic biomass

DESCRIPTION

1,3-propanediol, together with terephthalic acid, is used to produce polytrimethylene terephthalate (PTT). PTT is a high performance polyester polymer with remarkable "stretch-recovery" properties, and is used in apparel, upholstery, carpet, specialty resins, and other applications where properties such as softness, comfort-stretch and recovery, dyeability, and easy-care are desired.[1] It is currently manufactured from petrochemical feedstocks by Shell Chemical (CORTERRA Polymers) and DuPont (Sorona® 3GT).[2]

Although chemical companies have known about the desirable attributes of PTT polyester for more than 50 years, only recently has the industry perfected a commercially viable process to produce corn-derived 1,3-propanediol.[1] During an initial research phase, scientists from Genencor and DuPont successfully combined DNA from three different microorganisms into one production strain and in doing so achieved greater than a 500-fold improvement in productivity.[2] DuPont is producing corn-derived PDO at a pilot facility in Decatur, Ill., where carbohydrate processor Tate & Lyle operates a fermentation plant.[3] DuPont has announced that by 2006 it plans to construct a large-scale PDO fermentation facility based on the new bioprocess.[1]

REPRESENTATIVE BIOBASED PRODUCT OPPORTUNITIES

BIOBASED PRODUCT	CLASSIFICATIONS	MARKET OPPORTUNITY	MARKET SIZE
Polytrimethylene terephthalate (PTT)	Polyester plastic	PTT is a high performance polyester polymer with remarkable "stretch-recovery" properties, and is used in apparel, upholstery, and carpet.[2] Virtually all PTT is currently manufactured from petrochemicals.	Markets for PTT in the previous column are estimated at 500 million pounds per year.[2]
Polytrimethylene terephthalate (PTT)	Polymers, resins	Studies have shown that the properties of PTT surpass nylon and polyethylene terephthalate (PET) in fiber applications and polybutylene terephthalate and PET in resin applications such as sealable closures, connectors, extrusion coatings, and blister packs.[2]	Markets for nylon, PET, and polybutylene terephthalate are very large, but they are available at a low price of $0.20 to $0.30 per pound.[2]

REFERENCES

[1] Clothing from Cornfields: DuPont Develops a Fermentation-Based Process to Create Sorona® Polymer from Renewable Resources. DuPont Company. www.dupont.com/sorona/literature.html (20 April 2004).

[2] Energetics Incorporated. 2003. Industrial Bioproducts: Today and Tomorrow, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Office of the Biomass Program, Washington, D.C.

[3] Genencor/DuPont Team Receives U.S. EPA's Presidential Green Chemistry Award for New Innovation. Genencor, International. www.genencor.com/wt/gcor/pr_1056468867 (20 April 2004).