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Review on Economics for Propylene Glycol and Plant Design

Gaurav Vekhande[1], Chandan Thakur[2], Vishal Jaiswar[3], Ravi Tapre[4]
Final Year BE Chemical Students, Department of Chemical Engineering[1,2,3]
Assistant Professor, Department of Chemical Engineering[4]
Datta Meghe College of Engineering, Airoli, Navi Mumbai, Maharashtra, India

Abstract: *One of the most promising processes for biomass conversion to chemicals is the hydrogenolysis of glycerol to propylene glycol. Conventional hydrogenolysis operations, on the other hand, are frequently carried out at high H2 pressures and temperatures, resulting in high energy demands, rapid catalyst deactivation, and possible safety issues during H2 handling. The energy and atom efficiency of catalytic transfer hydrogenolysis (CTH) are both high. For the CTH of glycerol, we investigated a number of new solid catalysts. Detailed studies on energy optimization, tech- economic analysis, and environmental impact for both processes have been undertaken as part of this endeavors. The most important discovery is that the CTH process requires substantially less energy and capital expenditure. In the case of transfer hydrogenolysis, CO2 emissions per unit of propylene glycol are substantially lower. The findings of this research could be valuable in the development and deployment of novel hydrogenolysis technologies for additional energy and environmental applications. In laboratory scale studies, a Cu-ZnO-Al2O3 catalyst was shown to effectively generate propylene glycol from glycerol utilizing a liquid phase hydrogenolysis process at 410 F and 580 psia. To achieve complete contact of the liquid and vapor phases with the solid catalyst, a trickle-bed reactor will be used. This research intends to scale up this reactor model, which has only been tested in bench scale so far. This process is expected to produce 100 million pounds of propylene glycol per year, according to the design specifications. Propylene glycol (PG) is a very versatile chemical that is utilized in a wide range of industrial applications, including transportation, building, and food and pharmaceutical manufacturing. Propylene glycol of pharmaceutical (USP) grade is at least 99.5 percent pure by weight and is utilized in health-related items such as food, personal care products, cosmetics, and medications. PG from propylene oxide is the principal method for producing propylene glycol in the current context. Other ways for producing Propylene glycol, such as PG from lactic acid and Propylene glycol from glycerol, are also employed. Because of the rising demand for propylene glycol, new ethylene manufacturing methods are required. Due to the major study of producing Propylene glycol with strong selectivity and conversion, the direct conversion of propylene oxide to Propylene glycol technique has been under active research over the past 15-20 years. Our project's goal was to assess all three ways of production and construct a facility for the most efficient procedure.*

Keywords: Glycerol, Propylene Glycol, Hydrogenolysis, Cu-ZnO-Al2O3, CTH.

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BIOGRAPHY

- **First Author, Second Author, Third Author:** Gaurav Vekhande, Chandan Thakur, Vishal Jaiswar, B.E. in Chemical Engineering, Chemical Engineering Department, Datta Meghe College Of Engineering, Airoli, Navi Mumbai, India.
- **Fourth Author:** Ravi Tapre, Assistant Professor in Chemical Engineering , Chemical Engineering Department, Datta Meghe College of Engineering, Airoli, Navi Mumabi, India.