Thermochemical Conversion of Sugars to Bio-Based Products

Todd A. Werpy, Ph.D., Allan Zacher, and John Frye
Pacific Northwest National Laboratory, 902 Battelle Blvd., MSIN:K2-12,
Richland, Washington 99353

Conversion of aqueous solutions of sorbitol to produce polyols such as ethylene glycol, propylene glycol and glycerol afford an opportunity to substantially increase the value of glucose. Catalytic hydrogenolysis of sorbitol with respect to both conversion and selectivity is affected by several factors such as reaction temperature, hydrogen pressure, carbon support material, and the selection of the appropriate hydrogenolysis metal. Catalysts have been developed that improve the selectivity to the desired ethylene glycol, propylene glycol and glycerol products as well as catalysts that selectivity convert glycerol to propylene glycol. Economic analysis has shown that the most important consideration in the development of an economically viable process is the development of catalysts that afford high selectivity to desired products. Other considerations such as catalyst activity, catalyst lifetime, and operating conditions impact the overall process economics to a much smaller degree than the selectivity. An integrated approach that maximizes selectivity to propylene glycol and minimizes by-product formation has been developed and the associated economics developed for the overall process.