

Catalytic Hydrogenation of Dihydrolevoglucosenone to Levoglucosanol with a Hydrotalcite/Mixed Oxide Copper Catalyst

Background/Objective

Dihydrolevoglucosenone (Cyrene™), is a cellulose-derived bioproduct that may be converted via hydrogenation to levoglucosanol (LGOL), an important intermediate in the production of numerous industrially relevant chemicals. Historically, this type of reaction has been achieved via catalysis by costly and supply-limited Group VIII metals. Here, researchers instead demonstrate the use of a copper (Cu)-based catalyst in aqueous media to drive the hydrogenation reaction.

Approach

- ❖ Researchers tested a catalyst of 8% Cu supported on a meso/macroporous structured MgAl hydrotalcite (Cu8/MgAlO_x-HP) in aqueous media with 5 wt% Cyrene™ under both batch- and continuous-flow conditions.

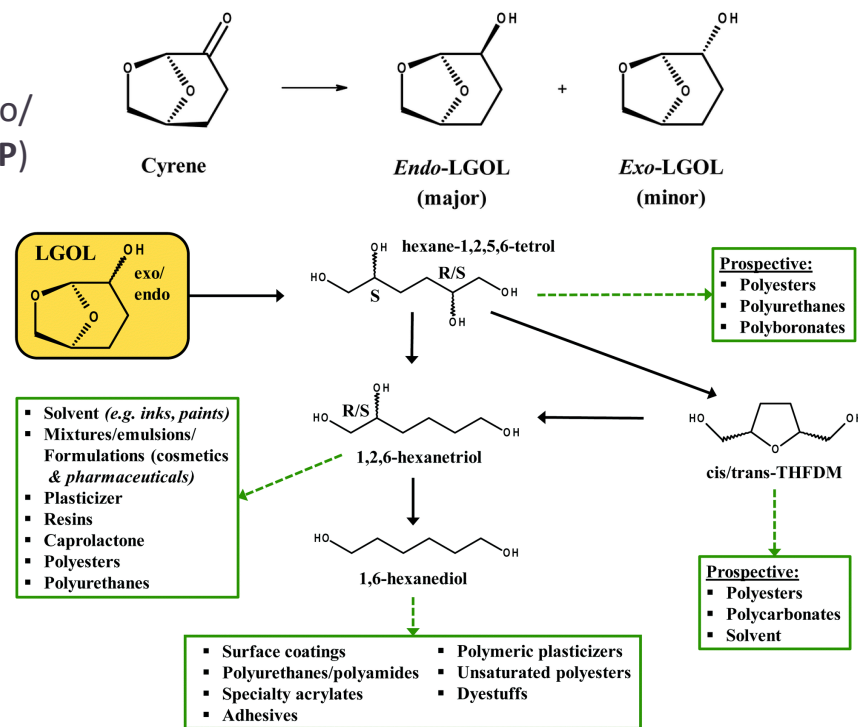
Results

- ❖ In a flow reactor, the Cu8/MgAlO_x-HP catalyst achieved stable activity, half that of the 0.4 wt% Pd/Al₂O₃ catalyst without the need for noble metals.
- ❖ The heterogeneous catalyst did not leach Cu and leached only minimal quantities of Mg.

Significance

This novel “green” catalytic method for the hydrogenation of Cyrene™ to LGOL provides a means of producing a valuable chemical precursor to numerous value-added chemical products. This work also provides a basis for the use of this catalyst on other carbonyl-containing substrates.

De Bruyn et al. 2019. “Catalytic Hydrogenation of Dihydrolevoglucosenone to Levoglucosanol with a Hydrotalcite/Mixed Oxide Copper Catalyst.” *Green Chemistry*. DOI:10.1039/c9gc00564a.



Schematic showing conversion of Cyrene™ to LGOL (top) and of synthetic possibilities using LGOL as a platform molecule (bottom).