Microbial Reduction of Furfurals to Furan Alcohols by a Microbial Species

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Technology Summary

An ORNL researcher developed a method for producing furfuryl alcohol (FA) through bioprocessing using a thermophilic microorganism. This organism has been shown to be highly resistant to the toxic effects of furfural and hydroxymethylfurfural (HMF) and can propagate in the presence of over 48 g/L (500 mM) of furfural.

The researcher found that the organism detoxifies its growth medium by reducing furfural and/or HMF to FA or 2,5-(dihydroxymethyl) furan, respectively. Presumably, excess reducing equivalents generated from the fermentation of glucose are transferred to the reactive aldehydes, converting them to the less toxic alcohol derivatives. These alcohol derivatives are themselves specialty chemicals. Alternatively, the alcohols can be reduced by methylation to fungible fuel components such as 2-methylfuran or dimethylfuran (DMF), or esterified with acids to form esters that can be components of bio-diesel or potentially bio-jet fuels.

Advantages

- Furan alcohols are converted to less toxic alcohol derivatives
- Alcohols are reduced or esterified to form fuel components

Potential Applications

- Furan alcohol production for specialty chemical market
- Production of biofuel precursors

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