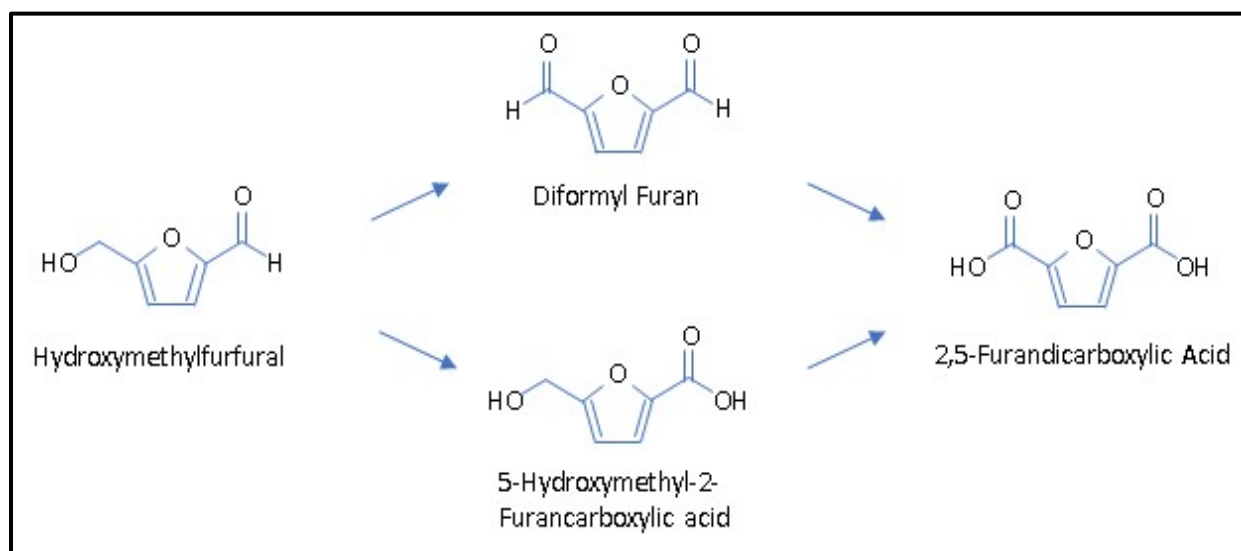


## BIO-BASED ALTERNATIVE TO BISPHENOL-A, DIOLS AND EPOXY RESINS FROM 5-HYDROXYMETHYL FURFURAL AND DIFORMYL FURAN (RFT-583/584)

### Invention Summary:

Scientists at NDSU have developed bio-based diols that are produced from compounds that can be extracted from cellulosic biomass. These diols may be used to produce epoxy resins without using bisphenol-A, as well as polyesters and polyurethanes. The epoxy resins can be used to produce a range of coatings, composites, and adhesives, including food and beverage container coatings. The compounds that are used to produce these diols are 5-hydroxymethyl furfural (HMF), diformyl furan (DFF), or derivatives of these compounds. The figure shows examples of the paths that can be utilized, but they are only a small sampling of the range of possibilities.



### Phase of Development:

This technology has successfully completed laboratory testing with reproducible results.

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**Benefits:**

- A wide range of diol monomers can be produced from bio-based raw materials
- These diols have potential to replace petroleum-based diols in a several polymers, including polyesters and polyurethanes
- Bio-based (and potentially GRAS) alternatives to bisphenol-A could be developed, e.g. for coating of food and beverage containers

**Patents:**

This technology is [U.S. patent pending](#) and is available for licensing/partnering opportunities.

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