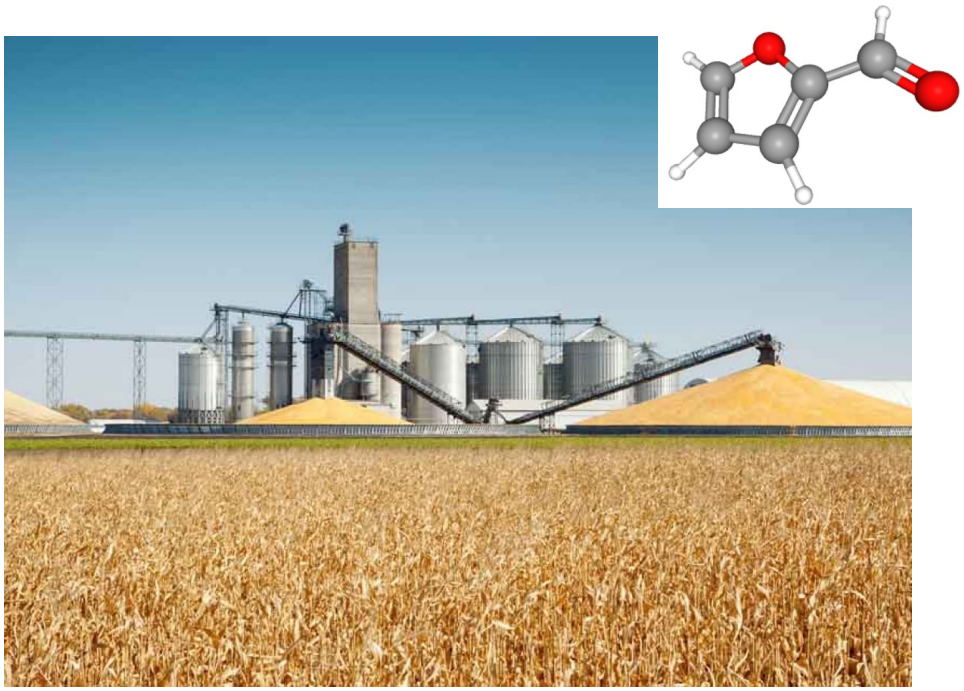


Los Alamos NATIONAL LABORATORY EST. 1943

Competitive Furfural Production : Producing Additional Revenue From Waste

LA-UR-21-20561

POTENTIAL **AREAS FOR PARTNERSHIP**

We have developed a method that uses the bran or fibrous byproducts of ethanol production to produce a high-price chemical called furfural and a high-protein residue suitable for animal feed that converts lower-value byproducts of corn ethanol production into a higher-value chemical feed residue. This process adds value to ethanol production, starch production, and other fiber-producing businesses to add additional value to your production facilities. Unlike previous methods for producing furfural, this non-toxic process offers extra revenue streams from waste products, such as high-protein residue suitable for animal feed with the only waste product being treated water.

Los Alamos National Laboratory is seeking a partner exploring opportunities to capitalize on its unused by products. We are seeking a collaborative research and development (CRADA) partner and/or a licensing partner to transition this technology and address specific needs within existing manufacturing processes.

SUMMARY

Los Alamos has developed an improved furfural process with high yields that produces high-protein bran residue suitable for animal feed, generates only treated water as its waste stream, and can be implemented with existing work flows that produce high-hemicellulose brans.

This new process takes a byproduct of ethanol production and converts it into a high-value industrial chemical at an estimated cost that is below the current market price. The process has the environmental advantages of consuming no mineral acids and producing furfural at higher yields than traditional methods.

POTENTIAL BENEFITS

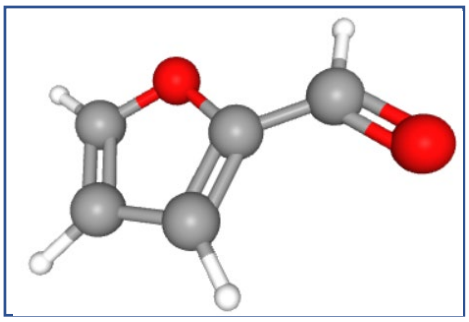
The competitive furfural synthesis process converts a low-value byproduct of corn ethanol production into a high-value chemical and a high-value feed residue. This easily implemented process may be incorporated alongside existing work flows to create additional revenue streams.

- May be implemented in existing plants
- Produces high-value furfural
- Converts bran or fiber to high-protein residue for added value in feed market
- No toxic by-products: only water
- High-yield furfural process
- Growing furfural market
- Large potential need for furfural production
- Extra revenue streams from waste products

FCI Richard P. Feynman Center for Innovation at Los Alamos National Laboratory

Corn bran precursor material

Example corn ethanol plant



Molecular structure of furfural

OUR MARKET APPLICATIONS

This technology targets the existing grain ethanol production industry as well as other high-hemicellulose producing industries such as starch and grain oil productions. The ethanol market is expected to reach a size of $129Bn by 2027 with a CAGR of 4.8%. By leveraging this growth market and employing the Los Alamos furfural synthesis method, a company can increase its revenue stream by offering high-value furfural as a product and by incorporating the high-protein fiber residue into the dried distiller grain and solubles.

OUR COMPETITIVE ADVANTAGES

Non-US furfural producers are the most direct competitors for the new process. These producers use corn cobs and a mineral acid-based synthesis with low furfural yield and a high rate of chemical consumption. The new, Los Alamos-developed, competitive furfural process avoids mineral acid, which reduces chemical consumption; produces a high-protein fiber residue suitable for animal feed; and may be implemented alongside ethanol production to add value by utilizing bran as a starting material.

WHAT IS UNIQUE ABOUT THE TECHNOLOGY

The traditional feedstocks for furfural production are corn cobs and sugar cane bagasse, which have low hemicellulose content. Most current furfural processes use sulfuric acid as a catalyst. The feedstocks and processes have low yields, high energy use, and high chemical costs; and they produce a low value residue.

Los Alamos researchers devised a new furfural process that uses bran, a material rich in hemicellulose, as the feedstock and uses no mineral acids. The result is a process with higher yields and lower energy and chemical consumption. The solid residue from this process is suitable for feed. This new process could lead to economical domestic furfural production, especially when integrated with corn ethanol production.

WHAT'S BEHIND OUR TECHNOLOGY

The new furfural process uses corn bran or similar hemicellulose-rich material as the feedstock for an environmentally-friendly, high-yield, low-waste furfural production. Behind this technology is a team of experts in chemical conversion of biomass and process engineers who specialize in developing novel methods for green synthetic methods for both government/military and commercial purposes.

OUR TECHNOLOGY STATUS

The new furfural synthetic method has been developed and tested at bench scale, and it is ready for pilot-scale testing. Techno-economic analysis indicates that this process can be economically viable, but this assessment needs verification. Initial testing and analysis has been performed using corn bran, though the process should be amenable to other sources of hemicellulose such as sorghum. We are seeking either a CRADA partner to fund pilot level testing to be done at Los Alamos or at the partner location, or a direct licensing partner who is interested in scaling up the process for production of furfural.

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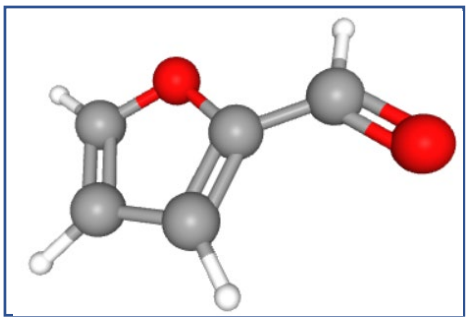
Corn bran precursor material

Example corn ethanol plant



Molecular structure of furfural

PREFERRED **PARTNER ATTRIBUTES**

- Ample in-house technical expertise in process chemistry. Existing ethanol production facilities or similar process, facilities management. Experience in prototyping of pilot facilities or existing pilot testing facilities.
- Personnel and capital to engage in collaborative development efforts under a CRADA to support technology maturation and technology transition.
- Concept for technology commercialization strategy and business plan (e.g., in-house pilot testing, manufacturing facilities, ethanol production facilities, distribution plan, etc.).
- Prior history of contracts with U.S. government agencies.

CRITERIA OF **EVALUATION?**

We expect interested respondents to reply to this commercial call with a one-page letter of intent clearly articulating their interest. Respondents will be evaluated against the preferred partner attributes outlined above, completeness of responses, technical acumen, and their overall strategy for engaging the Laboratory. In order to be eligible for consideration, respondents must adhere to deadlines provided by the Laboratory. The Laboratory reserves the right to update timeline and deadlines.

INTERESTED? **HERE ARE YOUR NEXT STEPS**

To respond to this call, please submit a letter of interest for this technology. The Laboratory will acknowledge receipt of this written response and will then send a commercial plan template for consideration as a way to provide additional information on respondent's strategy for engaging the Laboratory. The letter of interest is due by each interested respondent no later than 2/26/21. This information will be used in the evaluation process and will inform further engagement with respondents. All companies will receive a response.

Please send all correspondence to amymigliori@lanl.gov with "**Competative furfural synthesis – Commercial Interest – Company Name"** in the subject line.

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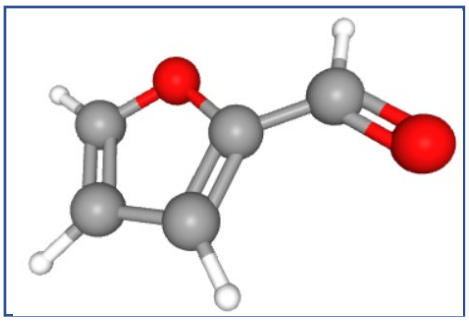
Corn bran precursor material

Example corn ethanol plant



Molecular structure of furfural

REFERENCES AND **DISCLAIMERS**

Intellectual Property

The Competitive Furfural Synthesis system has various components, and capabilities, which are subject to different intellectual property protections. Additional intellectual property protection is currently being developed and pursued. In order to support the larger Competitive Furfural Synthesis system additional intellectual property will continue to be developed and pursued in parallel with this commercial call and any future development work. Existing, and future intellectual property, originating from the Lab independently of any technology transfer contract may be available for licensing.

This commercial call is an opportunity to engage with the Lab to develop economically viable domestic furfural synthesis methods, and to potentially license the intellectual property arising from a potential CRADA opportunity.

References

- U.S. Patent Pending Application number 63/118501
- https://www.forbes.com/sites/kelseyatherton/2020/05/29/corn-powered-tomahawk-missiles-are-coming/#13b72a4c6f98
- https://www.lanl.gov/discover/publications/national-security-science/2020-spring/tomahawk.php

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