Polyamine-cellulose nanocrystals for the removal of dissolved metals in rendered fats (2022-036)

Novel treatment strategy that allows for rendered fats to be applied to high-value applications, including biodiesel, renewable diesel, and animal feed production.

Market Overview

The animal food industry produces enormous amounts of byproducts every year, including hooves, bones, blood, organs, and fat. These aggregated byproducts are collected and processed in rendering plants into various subproducts that reenter the industrial cycle. The rendered fats, composed of triglycerides from the adipose tissue of animals, are typically sold as lard, soaps, and additives for pet food formulations. However, the metal and inorganic contaminants in the rendered fat limit the marketability of the material towards biofuels, as the high metal concentrations poison refining catalysts. The development of this novel process allows for the removal of such metal and inorganic contaminants from the rendered fat. Currently, there are no other feasible strategies on the market to solve this problem. High value applications include biodiesel refining and animal feed applications. In particular, when considering the current context of energy scarcity, an effective, economic, and simple method for the removal of the undesirable elements could significantly contribute to the development of the emerging biodiesel and renewable diesel industries.

Technical Summary

Through the novel process, modified cellulose nanocrystals, a low-cost material can be applied along with water to significantly reduce the metal and inorganic burden in rendered fat samples. With the treatment strategy, concentrations of metals can be reduced by about 90% or more. After the combined extraction, the rendered fat can meet quality standards for their application in biodiesel or animal feed production.

Application

Biodiesel, Renewable Diesel, pet/animal feed

Development Stage

Available for Licensing

Advantages

- Allows access to high value applications for rendered fats.
- There is no other viable solution to this problem on the current market.
- Reduces concentrations of metal and inorganic components by about 90% or more.
- Methods utilize low-cost materials.
- The use of feedstocks for the generation of biodiesel is a rapidly growing market.

App Type	Country	CURF Ref. No.	Inventors
Provisional	United States	2022-036	Dr. Daniel Whitehead Dr. Carlos D. Garcia Dr. Ezequiel Vidal

About the Inventors

Dr. Daniel Whitehead

Undergraduate Program Coordinator and Associate Department Chair of Chemistry at Clemson University

Dr. Daniel Whitehead received his Ph.D. in Organic Chemistry from Michigan State University in 2009 and has been a faculty member at Clemson University since 2011. His bio-organic chemistry lab focuses on the development of new organic chemistry reactions, the discovery of new drugs for chronic diseases driven by parasites and bacteria, and functional nanomaterials for environmental and biomedical applications.

Dr. Carlos Garcia

Professor, Department of Chemistry at Clemson University

Dr. Carlos D. Garcia received his Ph.D. in Chemistry from the National University of Cordoba (Argentina) in 2001 and joined Clemson University in 2015. His group is focused on the development of various nanostructured materials and their use in analytical chemistry. His research has received support from the National Institutes of Health, National Science Foundation, National Agency for Space and Aeronautics, and the Office of Naval Research.

Dr. Ezequiel Vidal

Exchange Researcher in the Department of Chemistry at Clemson University

Dr. Vidal obtained his B.S. in Biochemistry (2001) and after a short stay in Europe, he was hired as a biochemist at the Central Bromatology Laboratory in Bahia Blanca (Argentina). Shortly after, enrolled in the doctoral program at the Universidad Nacional del Sur (Bahia Blanca, Argentina) and graduated in Dec 2020. His work is focused on the development of low-cost analytical devices based on image sensing and 3D printing technologies.

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