CURF
Clemson University Research Foundation

Lignocellulose-Sulfur Composite Materials for Construction Applications (2017-025)

Composites of agricultural and petrochemical wastes for environmentally friendly construction materials.

Market Overview

These composites chemically combine abundant agricultural and petrochemical wastes, allowing for practical reduction of inert wastes that can be used to either supplement or replace traditional construction materials. Approximately 7 million tons of waste sulfur and 5 million tons of waste lignocellulose are produced each year. Only a quarter of these sulfur wastes are utilized, while little to none of the lignocellulose wastes are used for other purposes. Clemson University researchers have created a method of using these wastes in a way that not only is environmentally friendly, but also income-producing. Their creation of construction materials that makes use of both waste streams provides a way to lower overall environmental impact and supplement the construction industry. These composites will better serve the construction industry by improving materials with enhanced properties such as water repellency, thermal stability, and mechanical strength.

Application

Sustainable/Green Construction Materials

Stage of Development

Prototype tested

Advantages

- Chemically modified composites allow for increased mechanical strength, chemical resistance, and reduced environmental contamination.
- Provides a practical use of both lignocellulose and sulfur wastes, creating an economically and ecologically value.
- These composites can either enhance existing materials or replace them, establishing a wide range of applications based on the needs of the user.

Technical Summary

These composite materials contain both lignocellulosic and sulfur-containing materials of which are combined through the promotion of covalent chemical bonding. Initially, the lignocellulosic materials are modified to include a multitude of carbon to carbon bonds. These bonds allow for cross-linking with the sulfur materials, and therefore allow for the formation of the basic structure of the composites. Doping the basic structure with additional materials provides enhanced properties that increase the overall reliability of the materials. Properties that are improved as a result of this method of synthesis include biocidal properties, water repellency, thermal stability, and mechanical strength. The covalent backbone within these materials also provides a reduction in environmental leaching potential, making these composites an environmentally friendly material.

CURF
Clemson University Research Foundation

App Type	Country	Serial No.	Patent No.	CURF Ref. Number	Inventors
Provisional	United States	62/511,713	NA	2017-025	Rhett C. Smith Andrew G. Tennyson

About the Inventors

Dr. Rhett Smith is an Assistant Professor of Chemistry at Clemson University, where he focuses on organic materials. He earned his Ph.D. from Case Western Reserve University and was a National Institute of Health postdoctoral fellow at the Massachusetts Institute of Technology. His research focus here at Clemson includes synthesis and applications of organic and inorganic materials for fluorescent sensing of biological agents such as neurotoxins, preparation of enzymatic active site models, and discovery of environmentally-friendly catalytic reactions.

Dr. Andrew Tennyson is an Assistant Professor of Chemistry at Clemson University, where his focus lies within the field of inorganic chemistry. He earned his Ph.D. in bioinorganic chemistry from the Massachusetts Institute of Technology and was a postdoctoral fellow in organic/organometallic chemistry at the University of Texas at Austin. He currently serves as a faculty member in both Department of Chemistry and the Department of Materials Science and Engineering, and is a member of the Center for Optical Materials Science and Engineering Technologies (COMSET). His research interests include multidrug resistant diseases, detection of proto-inflammatory biomolecules, organic semiconductors, and bilayer interfaces and monophase composites.

For More Information

To learn more about this technology, please contact:

Andy Bluvas

Technology Commercialization Officer

bluvasa@clemson.edu

(864) 656-5157