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Biodegradable Polymers for Pollutant Remediation and Toxin Reduction (2013-054)

Functionalized Biodegradable Polymers to Neutralize Mixtures of Organic Compounds from Environmental Sources

Market Overview

This innovation is the process of using poly(lactic) (PLA) particles equipped with appropriate functional groups that allow the complex to effectively sequester specific pollutants via chemical reactions. This technology's ability to address complex mixtures of contaminants utilizing an environmentally safe method results in odor absorbing applications, including direct application on odor sources, air filtration, VOC capture, and odor absorbing coatings and paintings. Traditional odor and pollutant elimination methods use toxic material platforms for non-specific reactivity and nondisposable resources. However, Clemson University researchers developed a method to create environmentally friendly, disposable PLA particles decorated with tunable functional groups. These functional groups can be effectively varied in order to successfully allow the complex to react and degrade a variety of pollutants. This technology could benefit companies involved with but not limited to water and air treatment, protective coatings, industrial coatings, plaster and dry wall materials, paint coatings, and advanced material additives.

Application

VOC capture management; Green materials

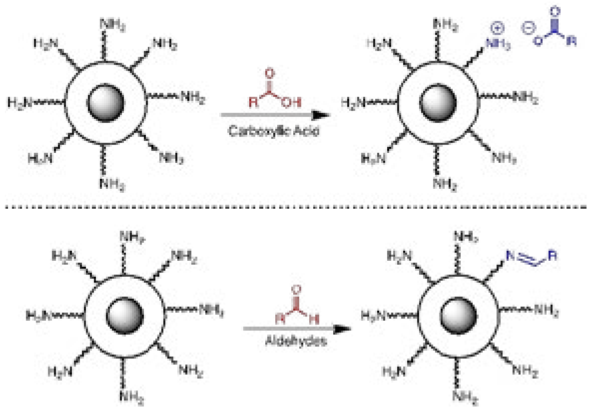
Stage of Development

Validated Prototype

Advantages

- Raw materials are plant-based and renewable, resulting in environmentally friendly degradation of by-product contaminants in gas and aqueous solutions
- Variety of functional groups can be incorporated on the PLA particle, customizing functionality and degradation time and allowing particles to specifically capture molecules from complex mixtures

Technical Summary



This patent pending technology is a method of modular formulation of biodegradable, non-toxic poly(lactic acid) (PLA) materials with surface-decorated nucleophiles/oxidants for the capture of environmental pollutants and/or toxins. The process involves using PLA particles equipped with the appropriate functionality to react and neutralize aqueous and gaseous pollutants. The surface of the PLA particles, decorated with various functional groups, allows the complex to react and degrade a variety of pollutant classes. The functional groups can be varied to ensure complementary reactivity with different pollutants and successful sequestering via chemical reactions. The technology has been successfully tested into rendering plant sites for capturing malodorous gases. The manufacturing process to scale up the production of the technology has been demonstrated.

For More Information Contact: Chris Gesswein | agesswe@clemson.edu | (864) 656-4935| CURF Reference No. 2013-054

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About the Inventors

Dr. Frank Alexis is an Associate Professor in the Department of Bioengineering at Clemson University. He earned his Ph.D. in Materials Science from the Nanyang Technological University in Singapore. Prior to joining Clemson University, he was a Postdoctoral Fellow at the Institute of Bioengineering and Nanotechnology in Singapore, the Center of Cancer Nanotechnology Excellence at MIT, and the Brigham's Women's Hospital in Boston. His research interests focus on polymeric and biodegradable nanoparticles, targeted drug delivery systems.

Dr. Daniel Whitehead is an Assistant Professor in the Department of Chemistry at Clemson University. He earned his Ph.D. in Chemistry from Michigan State University after completing his B.S. and M.S. at Furman University. He was previously a postdoctoral fellow at North Carolina State University. His laboratory is broadly interested in synthetic organic chemistry, with projects ranging from new synthetic methodology, bio-organic chemistry, and functional polymeric materials

For More Information

To learn more about this technology, please contact:

Chris Gesswein
Technology Commercialization Officer
agesswe@clemson.edu
(864) 656-3607

Application Type	Country	Serial No.	Patent No.	CURF Reference No.	Inventors
Utility	United States	15/012,991	NA	2013-054	Daniel Whitehead, Frank Alexis