Highly Recyclable Thermosets for Lightweight Composites

CRADA 517 (PNNL 76959)

December 2021

Leonard S Fifield

University of Akron
Raytheon Technologies Corporation
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PACIFIC NORTHWEST NATIONAL LABORATORY
operated by
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for the
UNITED STATES DEPARTMENT OF ENERGY
under Contract DE-AC05-76RL01830

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Abstract

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Pacific Northwest National Laboratory
Richland, Washington 99354
Abstract

Lightweight composites are of increasing need to enable reduced fuel usage, reduced carbon emissions and increased range in air and ground transportation. The superior weight savings of carbon fiber thermoset composites are impeded by material and production costs and the limited options available for composite repair and recycle. The materials recovery and recycling sector is currently overwhelmed by an abundance of low-value materials and limited market opportunities for downcycled content, rendering landfilling a more attractive alternative. Vitrimers represent a new paradigm for repairable and recyclable thermosets, but this relatively new technology will require development, including government investment, to reduce risks for its adoption by aerospace and automotive OEMs. The overall goal of the project is to create recyclable carbon fiber composites using vitrimer resins that are more energy efficient to produce and have improved properties over baseline technology. The targeted composites will retain their tensile strength after multiple recycling and reprocessing steps. In addition, monomer will be recoverable through depolymerization and re-usable carbon fibers will be retrieved.