

Upcycling of CFRP Waste: Viable Eco-friendly Chemical Recycling and Manufacturing of Novel Repairable and Recyclable Composites

Summary/Abstract

A team of researchers led by Washington State University (WSU) will collaborate on a project entitled “Upcycling of CFRP Waste: Viable Eco-friendly Chemical Recycling and Manufacturing of Novel Repairable and Recyclable Composites” sponsored by the EERE program of the Department of energy. In this project, the researchers aim to develop a viable chemical recycling technology for carbon fiber reinforced epoxy composite (CFEP) wastes, which is eco-friendly, energy-efficient and cost-effective in breakdown of the matrix polymer structure and makes use of both recovered carbon fiber (rCF) and decomposed matrix polymer (DMP) in new advanced composite manufacturing.

The rapid growth of the polymer composite market also propels researchers to find value-added applications for the out-of-date prepregs, manufacturing scraps, and end-of-life components. At present, most polymer composite wastes are disposed by burning or landfill. To make use of the residual value and reduce the burden to environment, various mechanical, thermal and chemical approaches have been attempted to recover fiber, matrix or both. However, these current practices are disadvantageous of low-cost effectiveness, energy inefficiency, generating secondary waste and bringing new pollution problems. In this project, the research team will develop a new CFEP recycling platform that address all existing problems with current recycling methods and introduce high-value polymer materials based on the recyclates. The key innovation resides in the integration of mild chemical recycling of CFEP and preparation of new composites.

The success of this project will address the most significant cost/technology barriers for thermosetting composite recycling. With this technical research success, the developed technology will move from lab scale to small pilot scale in collaboration with commercial partners. We expect to advance the technology from current TRL 2-3 to TRL 5-6 by the end of this project.

The project is led by WSU professor Jinwen Zhang, and the major team members include Tuan Liu, Michael Wolcott, both from WSU, Long Jiang of North Dakota State University, Kevin Simmons of Pacific Northwest National laboratory (PNNL).