

New chemical process can extract virgin-grade materials from wind turbine blades

April 26 2023



Credit: Pixabay/CC0 Public Domain

Researchers have developed a new chemical process that is not limited to wind turbine blades but works on many different so-called fiber-reinforced epoxy composites, including some materials that are reinforced with especially costly carbon fibers.

This process could contribute to establishing a potential [circular economy](#) in the wind turbine, aerospace, automotive and space

industries, where these reinforced composites, due to their light weight and long durability, are used for load-bearing structures.

Being designed to last, the durability of wind [turbine blades](#) poses an environmental challenge. Wind turbine blades mostly end up at waste landfills when they are decommissioned, because they are extremely difficult to break down.

If no solution is found, we will have accumulated 43 million tons of wind turbine blade waste globally by 2050.

The newly discovered process is a proof-of-concept of a recycling strategy that can be applied to the vast majority of both existing [wind turbine blades](#) and those presently in production, as well as other epoxy-based materials.

The results have just been published in *Nature*, and Aarhus University, together with the Danish Technological Institute, have filed a [patent application](#) for the process.

Specifically, the researchers have shown that by using a ruthenium-based catalyst and the solvents isopropanol and toluene, they can separate the epoxy matrix and release one of the epoxy polymer's original building blocks, bisphenol A (BPA), and fully intact glass fibers in a single process.

However, the method is not immediately scalable yet, as the catalytic system is not efficient enough for industrial implementation—and ruthenium is a rare and expensive metal. Therefore, the scientists from Aarhus University are continuing their work on improving this methodology.

"Nevertheless, we see it as a significant breakthrough for the

development of durable technologies that can create a circular economy for epoxy-based materials. This is the first publication of a chemical process that can selectively disassemble an epoxy composite and isolate one of the most important building blocks of the epoxy polymer as well as the glass or carbon fibers without damaging the latter in the process," says Troels Skrydstrup, one of the lead authors of the study.

Troels Skrydstrup is a professor at the Department of Chemistry and the Interdisciplinary Nanoscience Center (iNANO) at Aarhus University.

More information: Troels Skrydstrup et al, Catalytic disconnection of C–O bonds in epoxy resins and composites, *Nature* (2023). [DOI: 10.1038/s41586-023-05944-6](https://doi.org/10.1038/s41586-023-05944-6)

Provided by Aarhus University

Citation: New chemical process can extract virgin-grade materials from wind turbine blades (2023, April 26) retrieved 13 May 2024 from <https://phys.org/news/2023-04-chemical-virgin-grade-materials-turbine-blades.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.