

Recycling of Carbon Fibre Composites from Hydrogen Storage Vessels

Objectives

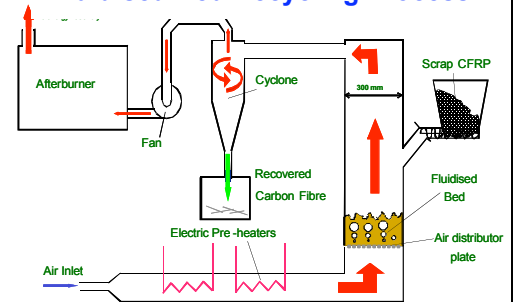
- ❖ Develop and demonstrate recycling technology for carbon fibre composite materials that can produce a high quality recycled carbon fibre, be potentially viable and demonstrate a positive environmental balance.
- ❖ Determine pre-treatment necessary to prepare hydrogen storage vessels for recycling.

Achievements

The following processes have been developed and demonstrated:

- ❖ Demonstration of a strategy for preparing hydrogen storage vessels involving removal of liner followed by shredding in a hybrid shredder developed in the EU Craft project REACT.
- ❖ Demonstration that high grade carbon fibre can be recycled from hydrogen storage vessels using a fluidised bed process.
- ❖ Development of a novel microwave pyrolysis concept to give an improved material recycling rate for carbon fibre composites.
- ❖ Demonstration of the potential for recycling vessels made from thermoplastic composites.

Fluidised Bed Recycling Process



Product quality achieved:

- ❖ The recycled carbon fibre from the fluidised bed process has a clean fibre surface; no significant reduction in fibre diameter; tensile stiffness similar to virgin carbon fibre; tensile strength approximately 50% of that of virgin carbon fibre; good ability to bond to epoxy resin and electrical resistivity similar to virgin carbon fibre.
- ❖ The microwave pyrolysis process demonstrated that high quality carbon fibre recyclate could be recovered from a composite along with up to 74% recovery of the polymer as a chemical feedstock, thus increasing the overall material recycling rate.

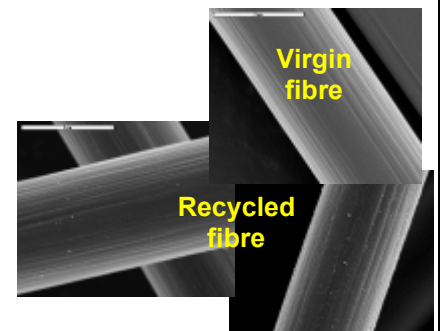
Added value:

- ❖ An increase in the material recycling rate for carbon fibre composites from 63% to 86% using the microwave pyrolysis concept.
- ❖ Demonstration of technology suitable for preparing pressure vessels.
- ❖ Demonstration of the ability of the fluidised bed process to separate a metallic coating from the composite during the recycling process.

Shredder



Shredded composite



Future Research

- ❖ Further development of microwave pyrolysis recycling concept to demonstrate viability.
- ❖ Development of recycling processes tolerant of contaminated composite material from whole vehicle shredding operations.

Partners

- ❖ University of Nottingham
- ❖ Ford Research Centre Aachen GmbH
- ❖ Dynetek Europe
- ❖ PSA Peugeot Citroën



Research & Advanced Engineering



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