Optimisation of pyrolysis parameters for CF composites with respect to mechanical properties of recovered fibers

M. Corvo-Alguacil, K. Umeki, R. Joffe

Luleå University of Technology, Luleå, Sweden

marina.corvo.alguacil@ltu.se

☒ Oral presentation ☐ Poster presentation

ABSTRACT

The aerospace/aeronautics, energy and automotive industries are the primary users of advanced polymer composites in structural components. Increasing number of those components are reaching End of Life and will be disposed in landfills, which is currently the most common option worldwide. However, environmental concerns and consequent demands from society drives industries to search for ways to repurpose decommissioned composite structures. The most beneficial would be to reuse composites and/or their constituents after the service life. Thermal recycling is a method to recover costly fibers and lower the environmental impact. The objective of this work is to optimize conditions of pyrolysis of carbon fiber (CF) composite aiming to recover reinforcement with highest mechanical properties. The specimens for this study were cut (15x30x3mm) from epoxy/CF laminate with randomly oriented fiber. To identify the best conditions, the pyrolysis is performed at different thermal cycles under various environments with mass loss monitored throughout the experiments. The conditions of the reference experiment are based on data from literature (550C for 30 min under nitrogen atmosphere, with oxidation in air for 60 min, see Fig. 1). Additionally, pyrolysis was performed under different temperatures and environments: variation of temperature on first stage, dipping specimens in hot furnace instead of gradual heating, changing conditions of oxidation. In order to select pyrolysis process with most optimal conditions the surface of the recovered fibres is investigated by means of optical microscopy and scanning electron microscopy. The mechanical properties of fibers are evaluated and compared to virgin fibers.

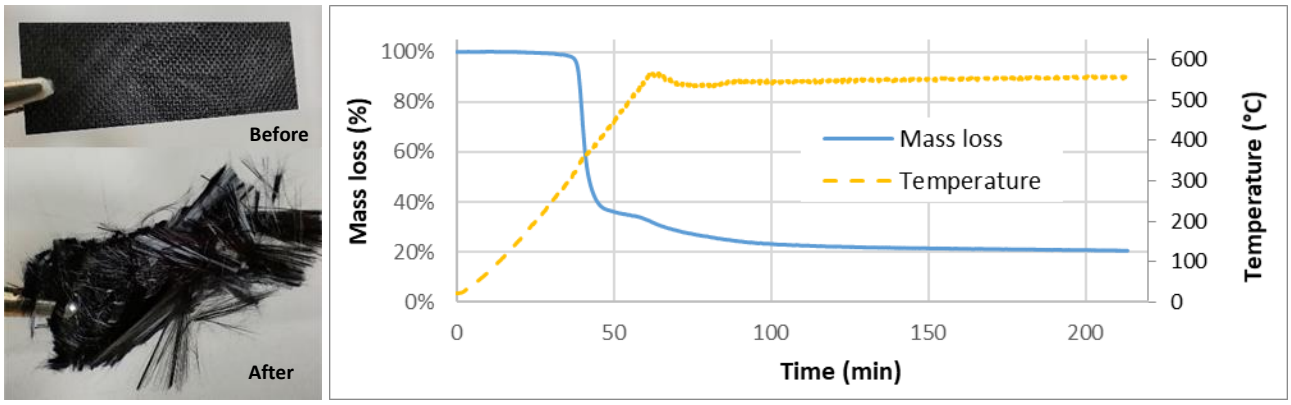

Fig. 1: Specimen before and after pyrolysis (left) with mass loss and temperature change (right)