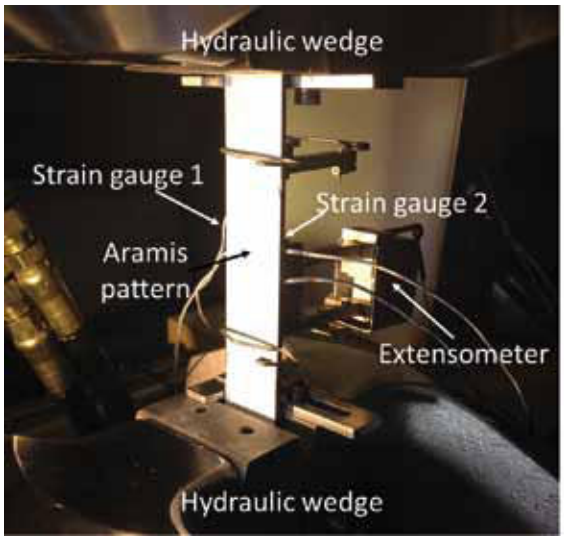
Fatigue behaviour of continuously carbon fibre reinforced plastics

Carbon fibre reinforced plastics (CFRPs) are increasingly used in the automotive and aerospace industry due to their light weight potential and outstanding specific mechanical properties.



Modern aerospace and automotive applications set new challenges to high performance materials. Especially the aerospace industry has increased the amount of composites in airplanes significantly in the last few years. Carbon and glass fibre reinforced plastics used in airframes, wings, fuselage or doors of innovative airplanes such as the A380 or the A350 help to reduce operating costs. During the life-time of such airplanes, the materials are loaded cyclically because of temperature, mechanical loads etc. fatigue loads change the behaviour of materials and usually decrease the mechanical properties. Consequently, sufficient material tests are a necessary prerequisite to ensure safe operation. Mechanical tests can range from testing the entire structures down to basic material tests on specimen level.

To characterise the fatigue behaviour on specimen level adequate strain measurement is necessary. However, the accuracy of different techniques depends highly on the direction of fibres in the anisotropic materials. Strain gauges, mechanical extensometers and optical systems were used to measure the anisotropic stress-strain behaviour of CFRP. In addition to the decrease of mechanical properties, different damage modes such as fibre fracture, inter-fibre fracture or matrix failure can occur depending on the direction of fibres related to the load direction. Investigations showed that damage mechanisms in tension-tension fatigue tests change with the volume content of fibres embedded in the matrix material and the height of the applied load level, too. Scanning electron microscopy (SEM) provided greater insight in the occurring damage mechanisms of the investigated CFRPs.

Julia Brunbauer
Materials Science and Testing of Polymers
at MUL since: 2012
julia.brunbauer@unileoben.ac.at
www.kunststofftechnik.at

Research Partner:

TCKT
Transfercenter für Kunststofftechnik GmbH

Personal Data:
2006-2011: Study of Polymer Engineering
2012: awarded with Erwin Wenzl Preis 2012

Research Focus:
Fatigue and life-time prediction of carbon fibre reinforced composites