Bachelor / Master Thesis

Determination of the Local Strain Tensor in Fiber Reinforced Polymers by means of Digital Volume Correlation based on Computed Tomography Data

Research Group Computed Tomography, FHOÖ Campus Wels

Fiber reinforced polymers are widely used in many different industrial sectors. Due to the increasing demands, regarding the mechanical and physical properties, it is necessary to have a closer look on the microstructure. Non-destructive methods such as X-ray computed tomography (CT) are of great advantage to get detailed volume information on the material systems and their behavior. Based on three dimensional CT data, property determining factors such as fiber orientation or fiber length distribution can be determined. Furthermore, occurring defects during tensile tests can be distinguished and characterized (an example is shown in figure 1). Of great interest is the connection between defect formation and local strains. Therefore the local strains and deformations of a test sample during interrupted in-situ tensile test need to be determined based on three dimensional CT data.

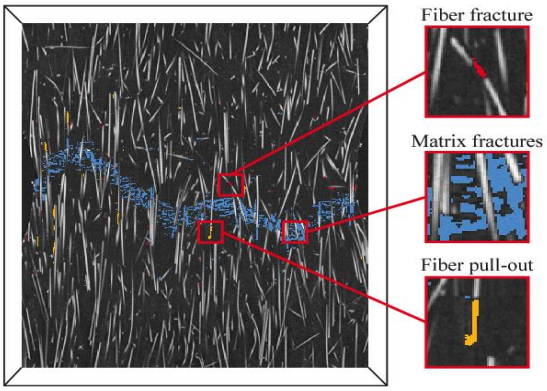

Figure 1: sectional image of the CT data of a glass fiber reinforced polymer with characterized and colorcoded defect types.

So the aim of this project is the determination of the local strain tensors. This can be done by the use of digital volume correlation (DVC). DVC allows the comparison of the volume data of the sample in unloaded and deformed state and is able to calculate the three dimensional displacement and local strains.

Tasks:

- Literature review (DVC in general, different software tools which allow the calculation of local strains, true strain vs engineering strain, etc.)
- Application of suitable software tools on selected CT data
- Comparison of the results and selection of the most suitable software tool
- Development of an workflow for the determination of the local strain tensor

Requirements:

- Basic knowledge of material science and image processing desirable (but not mandatory)
- Basic knowledge of python, C++ and MatLab advantageous
- Interest in new technologies and scientific work
- Goal-oriented and independent work

An employment during the holidays or during the study is possible. Detailed tasks can be defined during a personal conversation.

For more information contact:

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