

Bachelor's Thesis, Term Project, Master's Thesis

Analysis of Process-Induced Pores in Novel Hybrid Composites

Additive Manufacturing by Material Extrusion— also known as 3D printing – uses thermoplastic polymers to create complex structures layer by layer. Automated Fibre Placement places tapes of continuous fibres according on a given path. The project at the chair will combine these two composite manufacturing technologies into an Advanced Tape Layer Additive Manufacturing (ATLAM) process. By the integration of continuous fibres, it is possible to achieve identical coefficients of thermal expansion as traditional composite parts possess. The ATLAM process will enable aerospace manufacturers to generate composite tools quick and cheap compared to the current state. Specifically, for the current project, landing flaps for an Airbus passenger aircraft shall be manufactured with the produced tools. The long-term goal is to manufacture flying structural parts for the aerospace industry.

The newly developed material combination of the short fibre reinforced material and the continuous tape needs to be investigated for process-induced pores. It is expected, that the pores will affect vacuum tightness, mechanical and thermal performance. Depending on the process parameters such as temperatures, material drying, compaction forces or processing speeds a Design of Experiments (DoE) shall be conducted. A preliminary literature research will ensure the inclusion of all relevant parameters. The DoE should be kept as small as necessary to keep the workload manageable. Finally, printed specimens (with the ATLAM-printhead) will be prepared for micrograph analysis. Depending on the type and focus of the thesis, the work packages will be adapted.

Research focus of the thesis

- Literature research: Process parameters in AM and AFP affecting pore content
- Set up a Design of Experiments
- Micrograph generation and analysis
- Development of an empirical model

Requirements

- Clean and independent way of working
- Interest in composite materials
- Beneficial: Experience with Design of Experiments



Figure 1: 3D printed test cube

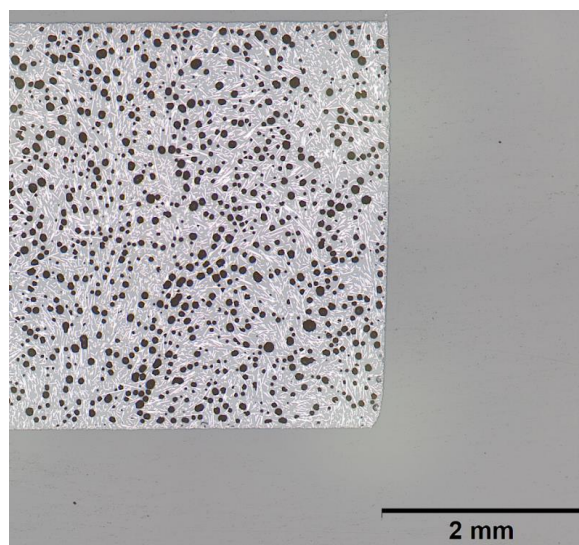


Figure 2: Microscopic Image showing pore content

Starting date: Now, flexible

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