

Bachelor's Thesis, Term Paper, Master's Thesis

Self-Heating Tooling: Mapping the State of the Art for 3D-Printed Curing Molds

Curing molds for carbon fiber reinforced composites are conventionally heated in autoclaves or ovens, which makes the process slow, energy-intensive and difficult to control locally. Large-format additive manufacturing (LFAM) now allows such molds to be printed directly from fiber-reinforced high-performance thermoplastics. At our chair, we go one step further: by making the printed material electrically conductive, the mold can heat itself through Joule heating and can even sense its own temperature and state. This is an emerging field that spans several disciplines, from polymer physics to process engineering and automation. Its scientific foundation is still scattered across many sources, and that is where you come in.

In your thesis, you will build the scientific foundation for this research through a structured, systematic literature review. You will define a reproducible search strategy, for example following PRISMA, and screen, classify and critically evaluate publications and patents. The review covers the relevant topics: conductive polymer compounds and percolation behavior, direct and integrated heating concepts for composite tooling, integrated temperature and strain sensing, LFAM of thermoplastics such as PA, PC and PEI, and the recyclability of such tools. You will condense your findings into comparative overviews and a structured knowledge base, identify research gaps, and derive recommendations for our ongoing work. Your results will feed directly into our current research and publications.

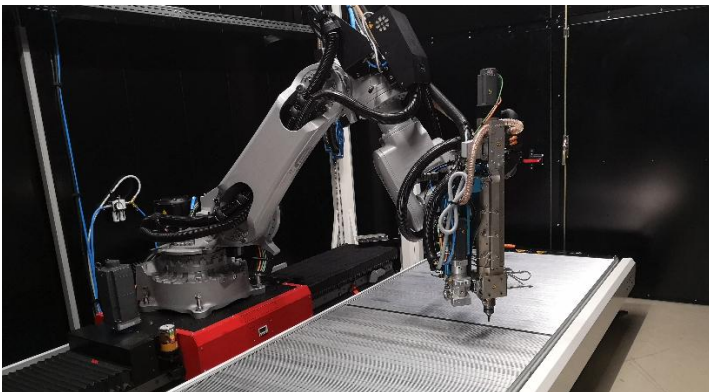


Figure 1: Large Format Additive Manufacturing System

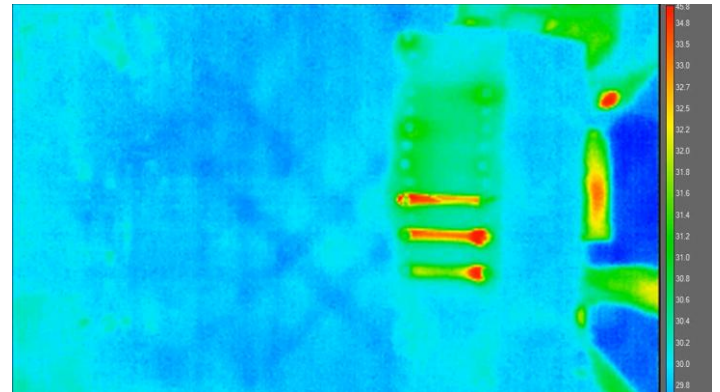


Figure 2: Exemplary Thermal Analysis of self-heating samples

Research focus of the thesis

- Curing Molds for FRPs
- Conductive Polymer Compounds and Self-Heating
- Systematic Literature Review and Patent Research
- Research Gap Analysis and Documentation

Requirements

- Interest in 3D printing, plastics and polymer physics
- Interest and ideally experience in structured literature work
- Self-organized, proactive and reliable way of working

Starting date: immediately

For more details please contact:

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