

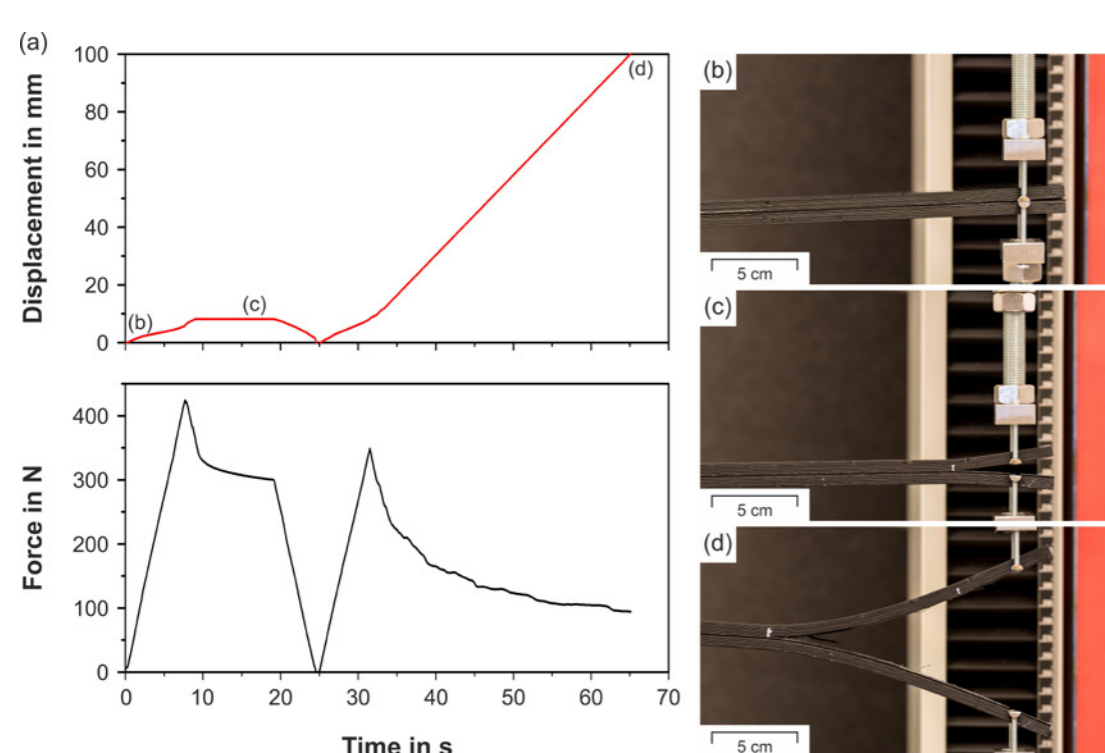
# Structural integrity in additive manufacturing of polymers

Florian Arbeiter

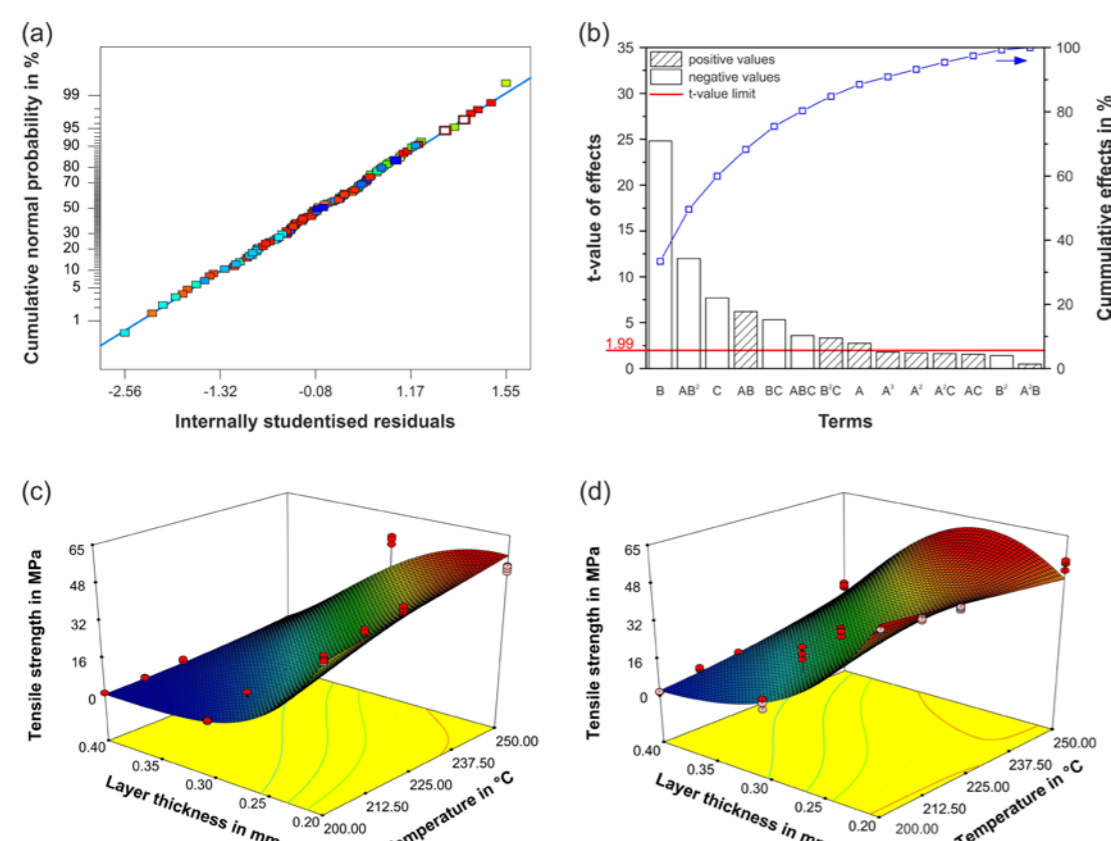
Additive manufacturing is already quite established for studies of design and functionality, as well as rapid prototyping. However, especially for structural components applications are still scarce, due to very limited knowledge about the mechanical and fracture mechanical properties of components manufactured with these new technologies.

## fracture/mechanical properties in AM

### energy release rate ( $G_{IC}$ ) between layers<sup>1</sup>

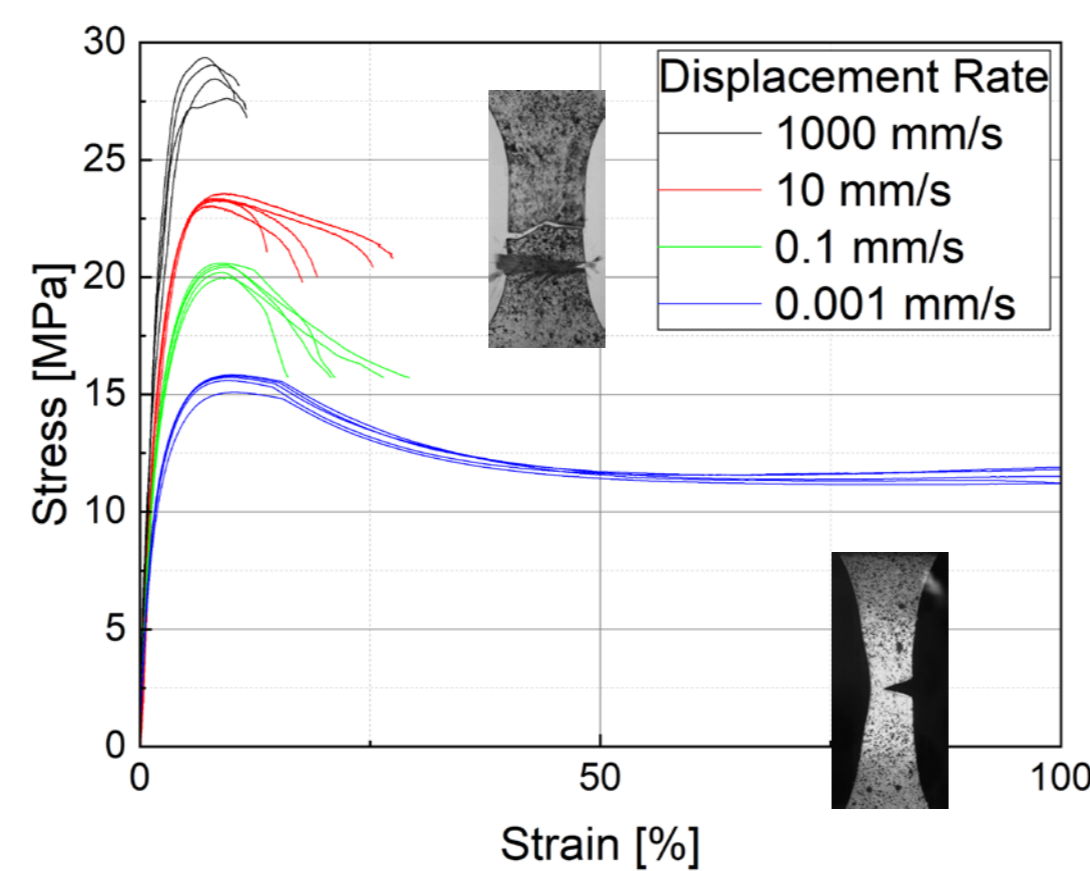


### statistical optimization of mechanical properties<sup>1</sup>

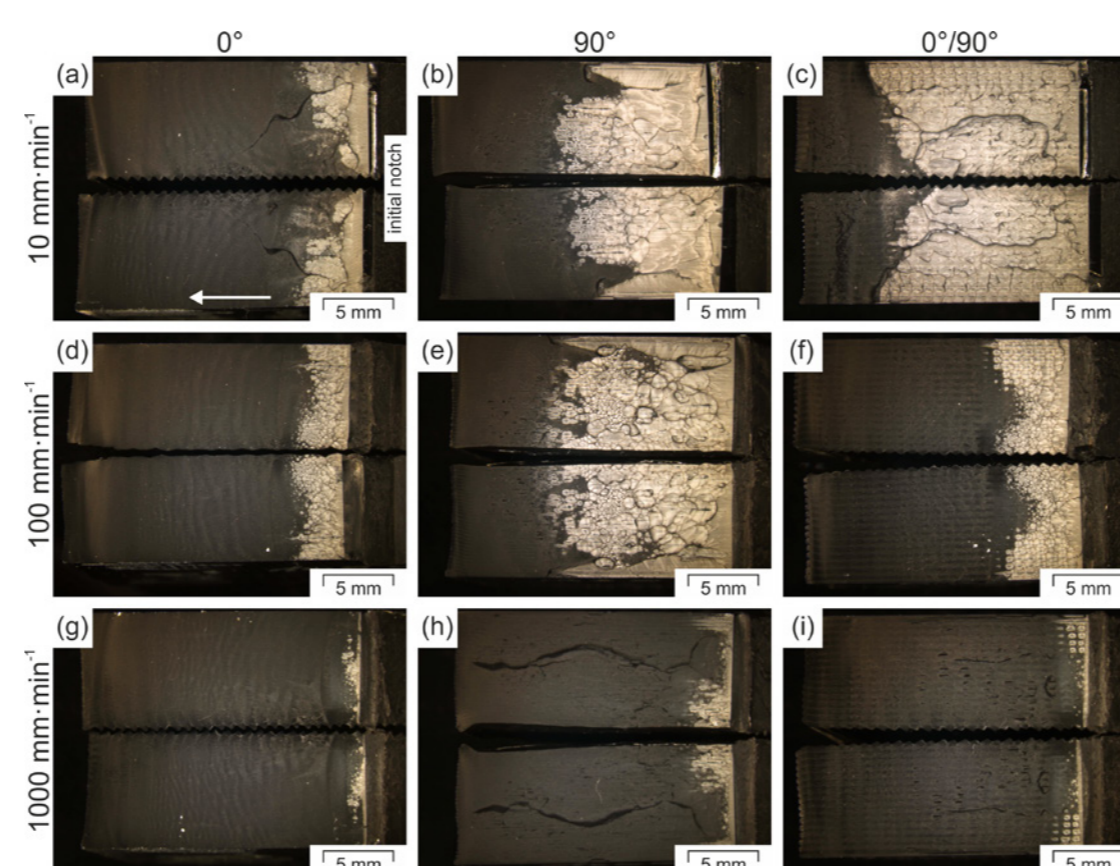


## impact properties of AM-materials

### strain-rate dependent mechanical properties<sup>2</sup>

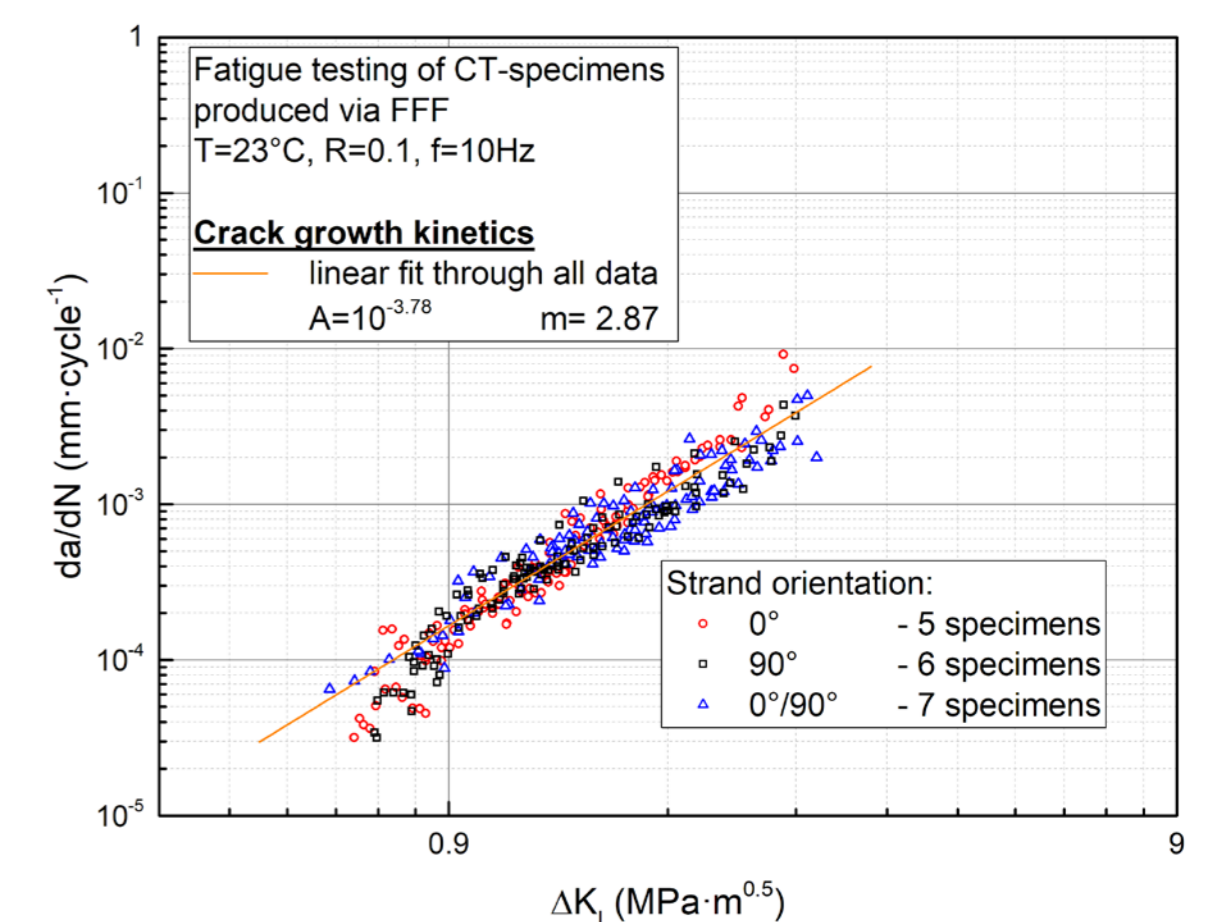


### influence of strain rate and orientation on toughness<sup>3</sup>

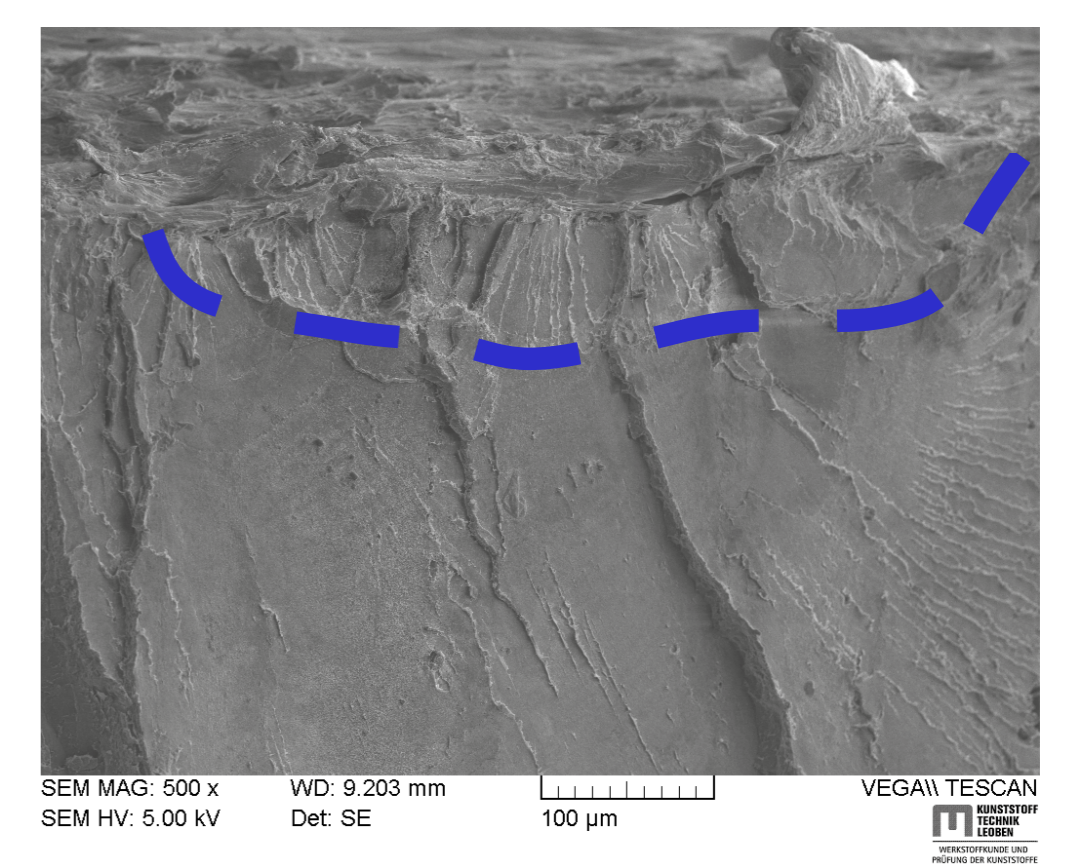


## fatigue and longterm properties in AM

### crack growth kinetic for lifetime estimation<sup>3</sup>



### processing induced defect and crack sizes<sup>4</sup>



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**RESEARCH FOCUS:** Polymer Fracture Mechanics, Polymer Pipe Materials, Impact Testing, Additive Manufacturing: Process-Structure-Property relationships

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**LITERATURE:** <sup>1</sup> Spörk & Arbeiter et. al. 2017: Applied Polymer Science (45601): Parametric optimization of intra- and inter-layer strengths in parts produced by extrusion-based additive manufacturing of poly(lactic acid), <sup>2</sup> unpublished Data: Petersmann & Arbeiter et. al. 2019, <sup>3</sup> Arbeiter & Spörk et. al. 2018: Polymer Testing (66): Fracture mechanical characterization and lifetime estimation of nearhomogeneous components produced by fused filament fabrication, <sup>4</sup> unpublished Data: Arbeiter & Hutař et. al. 2019