

PROCESS MONITORING

Surface quality measurement of thermoplastic composite parts using OrientationJ

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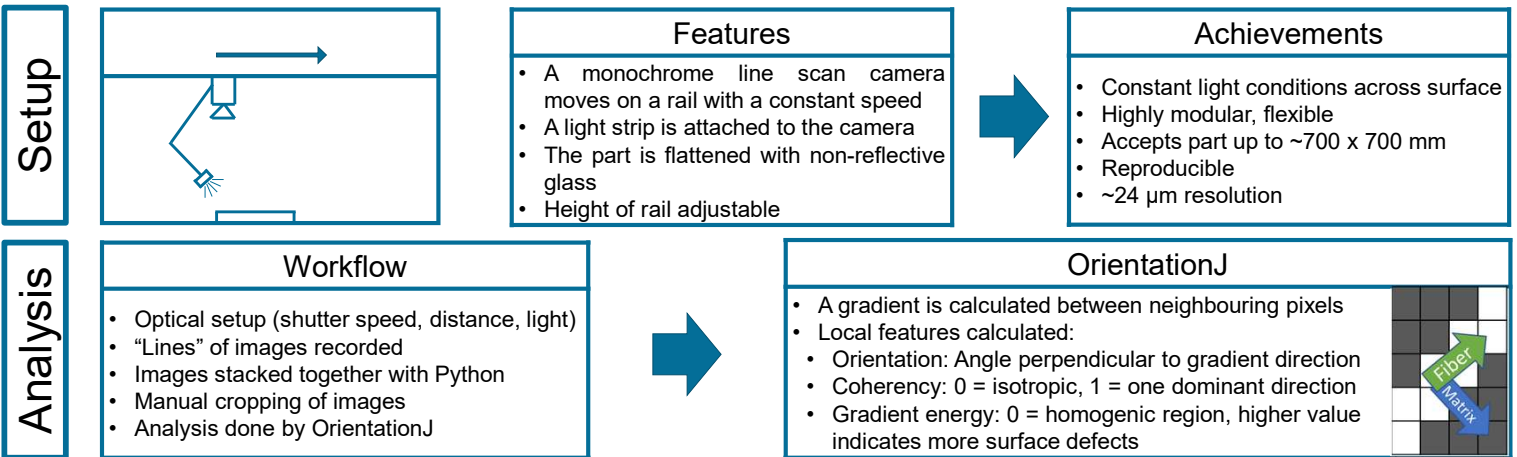
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Introduction

During the processing of **thermoplastic composites**, **surface defects** and **fiber waviness** can occur. In order to measure the surface quality of a thermoplastic composite part, a methodology is needed which is user independent, reproducible, and quantitative. The custom built **Photobox** can be used to record surfaces digitally, assess the **amount of surface defects**, and **measure the fiber waviness** across the surface.

Experimental



Results

Material	StD. Orientation	Coherency	Gradient Energy
Consolidated PC/CF plate	7.07°	0.678	0.0909
Cons. PC/CF plate with PEI foil	5.39°	0.7002	0.0513
PAEK Plate	4.84°	0.7568	0.109

Consolidated PC/CF plate

- Coherency is low and energy is high due to surface defects
- Orientation still assessable with defects

Cons. PC/CF plate with PEI foil

- Consolidating with PEI foil eliminates surface defects and improves coherency
- Fiber waviness also reduced

PAEK Plate

- Top half of PAEK plate shows lowest fiber waviness and highest coherency
- Bottom half more wavy, less coherent

Summary

The Photobox in combination with OrientationJ allows for quantitative assessment of surfaces of thermoplastic composites based on the standard deviation of fiber orientation, coherency, and gradient energy. These metrics can be used to further optimize process technologies based on surface quality and reveal process – structure – property relationships.

Danksagung: Diese Arbeit wurde unterstützt durch Competence Center CHASE GmbH.