Application Note POLYMER008

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POLYMER008: Observation of the Internal Structure of CFRP by in-situ X-ray CT Imaging during Tensile Testing

Introduction

To improve the durability of materials, it is important to correctly understand how they break. While fiber- reinforced plastic (FRP) is lightweight and strong, it exhibits complex fracture behavior, so it is not easy to capture the changes that occur before fracture. Micro X-ray CT allows nondestructive observation of the internal damage progression in three dimensions without cutting the specimen. Visualization of the fracture mechanism is effective for improving the accuracy of design and reliability evaluation.

Non-destructive imaging

Analysis:	Raw materials and parts products
Use:	Process control, failure analysis, quality assurance
Analyzed materials:	Carbon fiber reinforced plastic (CFRP)

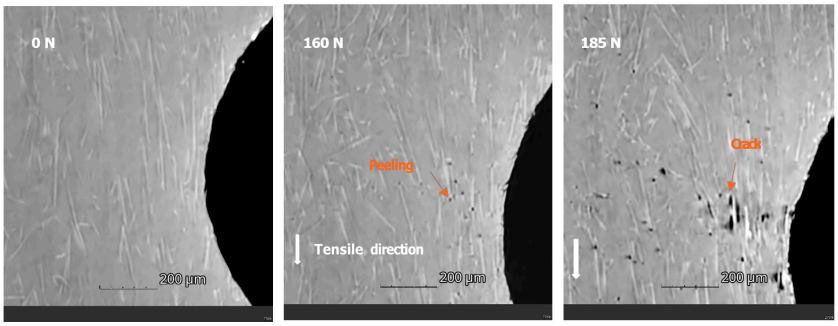

Figure 1: Cross-sectional image of CFRP at each tensile load

Conclusion:

Tensile load was progressively applied to the CFRP and in-situ CT imaging was performed for 8 minutes at 160 N of load, delamination occurred at the interface between the carbon fiber and resin, forming a void, and at 185 N, crack initiation was observed starting from the void (Figure 1). Thus, nondestructive visualization of the fracture process made it possible to identify signs of initial damage and interface abnormalities.

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