Application Note B-XRI1024

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B-XRI1024 - Fiber orientation analysis of short fibers in GFRPs by micro X-ray CT

Introduction

Some glass fiber-reinforced plastics (GFRPs) are molded by injection. Observation of the fiber orientation is essential for strength design of GFRPs. Radiographs and microscopes provide only two-dimensional information. Micro X-ray CT, on the other hand, can provide stereoscopic information about the length and position of fibers. An injection-molded GFRP plate was scanned by micro X-ray CT. The orientation of the glass fibers (GFs) was analyzed at the cross-section in the direction that divides the thickness of the plate, which is difficult to physically cut out.

Measurement and analysis

A sample of a molded GFRP fan blade approximately 0.6 mm thick was cut to 10 mm width and scanned at 3.6 µm/voxel for 17 min. The analysis area is 5 mm wide and 5 mm high and located at the center of the sample. Figure 1 shows the orientation angles of the GFs (1) on the inside and (2) at the surface (right edge) of the molded sample. On the inside (1), the GFs are colored red to yellow over a wide area of about 4 mm from the blade edge, indicating that many GFs are oriented in the width direction. On the other hand, on the surface (2), the GFs are colored blue to green over a wide area except for about 1 mm at the edge, indicating that many GFs are oriented in the vertical direction compared to the inside (1).

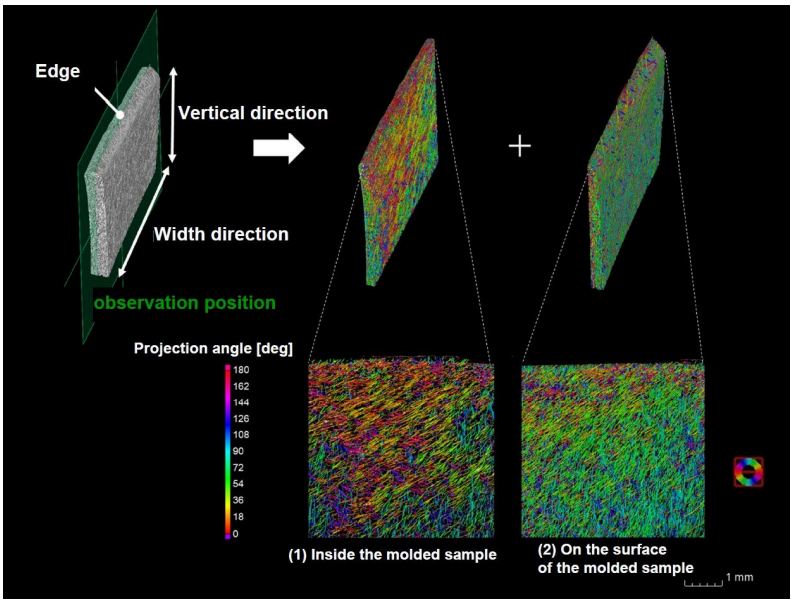

Figure 1: GF orientation inside and on the surface of a molded GFRP fan blade

Recommended equipment and software

- 3D micro X-ray CT CT Lab HX
- IIndustrial X-ray CT data analysis software VGSTUDIO MAX (Fiber orientation analysis module)

Related products

CT Lab HX

High-resolution benchtop microtomography of large samples