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What is Onyx

Onyx

Micro carbon fibre filled nylon (Onyx®), additive manufacturing / FDM

Onyx® is a nylon filament filled with microscopic chopped carbon fibres, designed for additive manufacturing using the FDM (Fused Deposition Modeling) process. It forms the base matrix of numerous composite parts and, compared with standard 3D printing plastics such as ABS or PLA, offers significantly higher stiffness and strength together with an exceptionally clean surface finish. At Liedtke, Onyx is processed by FDM into functional parts, fixtures and prototypes.

Material Character

Onyx consists of a nylon matrix filled with short, microscopic carbon fibres. This gives the printed material significantly higher stiffness and strength than unfilled 3D printing plastics, combined with a very good, consistent surface finish straight off the printer.

The material is chemically resistant and, depending on the 3D printing system used, can additionally be combined with continuous fibre reinforcement (carbon fibre, Kevlar® or fibreglass) to further increase mechanical properties towards metal-like strength. As a standalone base material without continuous fibre reinforcement, Onyx is already suitable for many functional applications.

Because Onyx is nylon-based, the material is hygroscopic like all polyamides and absorbs moisture from ambient air. The filament should be stored dry to maintain consistently high print quality.

Advantages and Limitations

Advantages

- Significantly higher stiffness and strength than standard 3D printing plastics (ABS, PLA)
- Very good, consistent surface finish straight from FDM printing
- Chemically resistant
- Can be combined with continuous fibre reinforcement (carbon, Kevlar® , fibreglass) for maximum strength
- Proven in more than one million printed parts in field use

Disadvantages

- Hygroscopic – requires dry filament storage for consistent print quality
- Not intended for food contact
- Properties of the printed part depend on print parameters, layer build-up and part orientation
- Without continuous fibre reinforcement, lower strength than fibre-reinforced machined semi-finished products

Processing

Onyx is built up additively, layer by layer, from filament using the FDM (Fused Deposition Modeling) process. The achievable mechanical properties of a part depend, in addition to the material itself, on layer height, infill density, print orientation and any continuous fibre reinforcement applied.

Post-processing steps such as sanding or drilling generate fine, carbon-fibre-laden plastic dust, which should be extracted.

Typical Properties

- High stiffness and strength for a 3D printing material
- Very good surface finish
- Chemically resistant
- Can be combined with continuous fibre reinforcement

Product Examples

- Functional prototypes
- Jigs, fixtures and tooling
- Housings and mounts
- Replacement for simple aluminium and plastic components

Typical Industries

- Prototyping
- Jigs, fixtures and tooling
- Mechanical engineering
- Product development

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	Test Method	Unit	Value
General Properties			
Density		g / cm³	1.2
Mechanical Properties			
Tensile modulus	ASTM D638	MPa	2400
Tensile stress at yield	ASTM D638	MPa	40
Tensile stress at break	ASTM D638	MPa	37
Tensile strain at break	ASTM D638	%	25
Flexural strength	ASTM D7901	MPa	71
Flexural modulus	ASTM D7901	MPa	3000
Izod impact strength (notched)	ASTM D256-10, Method A	J / m	330
Thermal Properties			
Heat deflection temperature (0.45 MPa)	ASTM D648, Method B	°C	145

The stated values are average values based on test specimens produced by the additive manufacturing process (FDM). They serve as information for material selection. The actual properties of manufactured parts additionally depend on print parameters, layer build-up and part geometry.

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