

# OXFAB® Technology

Additive Manufacturing of Industrial Structures



## The OXFAB® Technology Foundation: PEKK High Performance Polymer System

Poly-ether-ketone-ketone (PEKK) is an ultra high performance material that is part of the PAEK family of polymers, used extensively in high performance industrial applications, including:

- Aerospace & Defense
  - Automotive
  - Oil & Gas
  - Semiconductor

## OXPEKK® Materials: Mechanical, Thermal and Chemical Performance

OXPEKK is OPM's proprietary high performance PEKK polymer formulation, approved for highly regulated medical and industrial applications. OXPEKK materials are behind all OXFAB® parts and perform in the most demanding environments.

## OXFAB® Technology Platform: Reliable, Repeatable 3D Printed Parts

The OXFAB Technology platform consolidates manufacturing design aid, material, manufacturing and quality management into a single streamlined process. The result: a faster, more predictable path from design to end-use product.

## OXFAB® Surface Technology: Surface Treatments for Unique Applications

A versatile range of surface treatment options – including nickel – can further enhance the mechanical, thermal and chemical properties of 3D printed OXFAB structures

## 3D Printing Process:



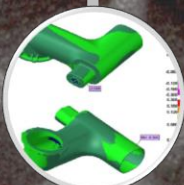
1. Digital build preparation



2. Selective laser sintering



3. Excavation of component



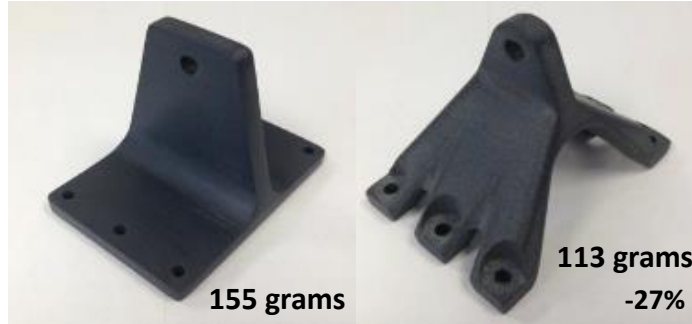
4. Visual/Dimensional Inspection



5. Shipment to customer

## OPM's 3D Printing Advantage

Laser melting is a pure 3D printing process that combines laser light and OXPEKK® polymer to produce fully-functional, mission critical components. OPM's manufacturing process enables complex design that exceeds traditional manufacturing methods.



Complex geometries allow for light weighting and feature consolidation. Reducing assembly components decreases time and cost required for component implementation.

Property (units)	OXFAB® N-R Unfilled, Recycled	OXFAB® ESD-V 15% Carbon, Virgin	OXFAB® ESD-R 15% Carbon, Recycled
Tension (ULT) XY	13.2 KSI	15.6 KSI	17.5 KSI
Tension (ULT) Z	9.0 KSI	7.9 KSI	13.4 KSI
Tension (MOD) XY	705 KSI	1010 KSI	1076 KSI
Tension (MOD) Z	718 KSI	680 KSI	729 KSI
Comp (ULT) XY	25.1 KSI	28.2 KSI	29.3 KSI
Comp (ULT) Z	25.2 KSI	28.8 KSI	29.5 KSI
Comp (MOD) XY	705 KSI	1395 KSI	1339 KSI
Comp (MOD) Z	718 KSI	1300 KSI	1167 KSI
CTE, XY in/in/°F 10 <sup>-6</sup>	24.5	15.4	17.5
CTE, Z in/in/°F 10 <sup>-6</sup>	24.6	26.4	25.6
Tg °F	311	311	312
Density (lb/in <sup>3</sup> )	0.049	0.050	0.050

## Excellent Strength and Performance

- Twice the compressive strength as PEEK; increases in most other mechanical properties
- Wets and incorporates fillers and fiber reinforcements

## Benefits of OXFAB® Technology Platform

- Efficient: Digital design, refinement optimization
- Effective: Material and process enable facile fabrication of complex parts
- Clean: Laser sintering process only has two components: OXPEKK® polymer and laser light



ONLINE  
oxfordpm.com



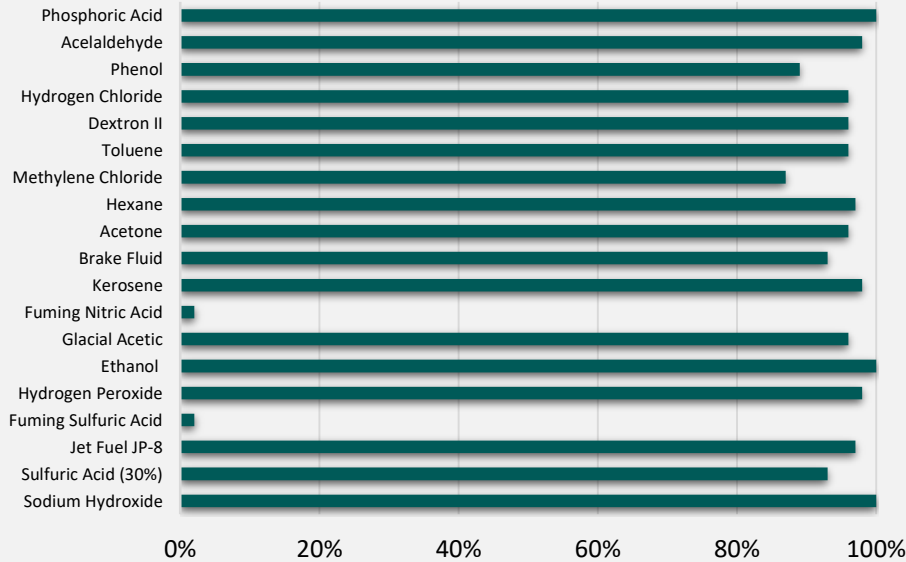
SUPPORT  
860.698.9300

# OXFAB® Technology: Chemical and Thermal Stability

## Resistance to Aggressive Solvents

OPM's OXPEKK® polymer is a highly chemically inert thermoplastic ideal for a variety of applications. It has been used extensively in aggressive environments such as down-hole and chemical fluid management systems.

### TENSILE RETENTION STRENGTH (7 Days R.T.)



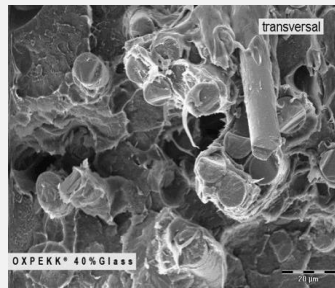
### Chemically Aggressive Environments

OXFAB® 3D printed components offer superior resistance to corrosion than its metal counterparts. This, combined with high mechanical performance, make OXFAB additive parts ideal for long term service in chemically aggressive, high pressure and high temperature environments.

### PEEK



### PEKK

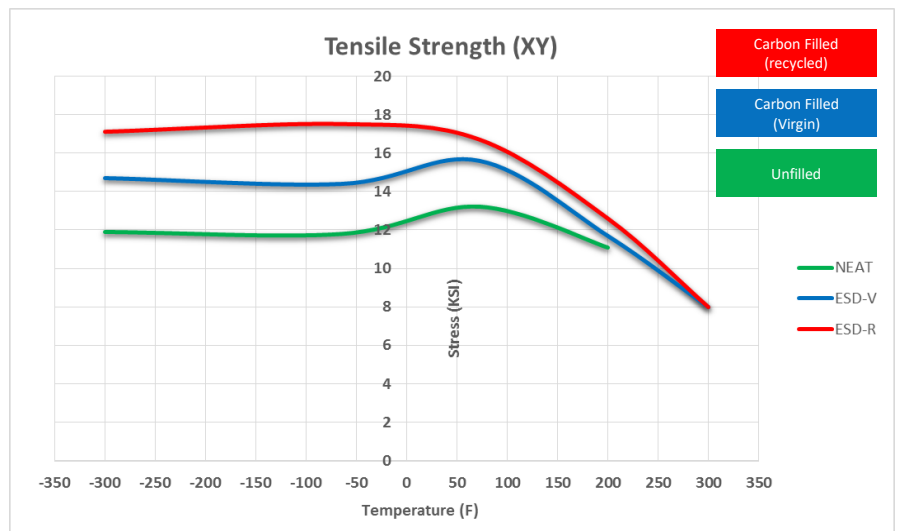


### Adhesion & Wetting

OXPEKK® fully adheres to fillers creating a seamless and complete transfer of load from matrix to fiber. Complete adhesion to fibers significantly reduces composite liquid uptake and creep.

### High Service Temperature

OXFAB® components offer the highest continuous service temperature of any 3D printed thermoplastic. This and other performance characteristics make OXFAB the process of choice for lightweight applications and replacement of metals and other incumbent technologies.

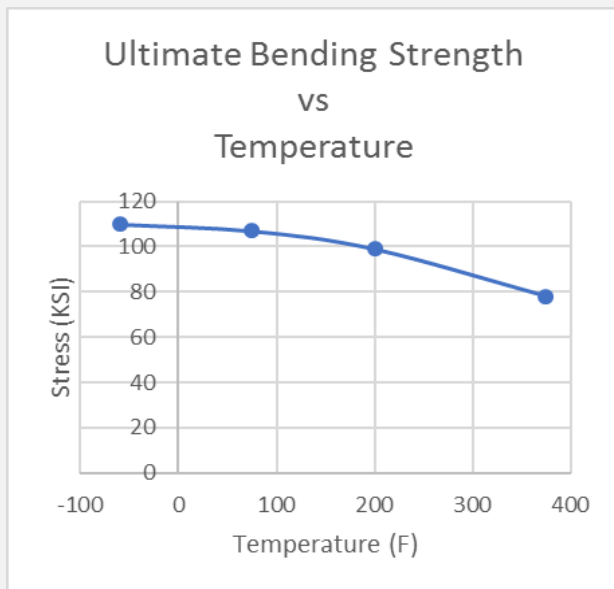


# OXFAB® Surface Technologies

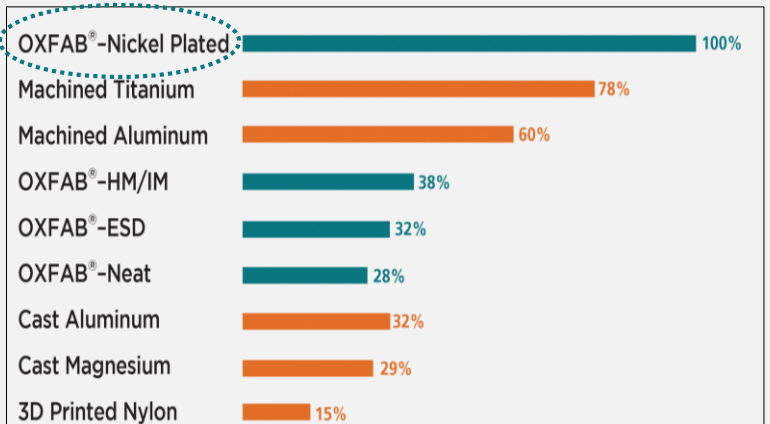
## Specialty Finishes Make OXFAB® Work for You

### OXFAB®-Ni

OXFAB-Ni is the marriage of OPM's industry leading 3D printed PEKK and proprietary nickel plating technology. The result is an ultra high performance composite that measures higher in strength than machined titanium parts at equal weights.



### Strength-to-Weight Ratio



## Versatile Range of OXPEKK® Treatment Options

- Finish
- Polish
- Paint
- Electroless Nickel
- Pad Resurfacing
- Other Coatings



**1. NOTICE TO USERS:** To the best of our knowledge, the information contained in this publication is accurate, however we do not assume any liability whatsoever for the accuracy and completeness of such information. The analysis techniques included in this publication are often simplifications and, therefore, approximate in nature. Any determination of the suitability of a particular material for any use contemplated by the user is the sole responsibility of the user. Material data and values included in this publication are either based on testing of laboratory test specimens and represent data or were extracted from various published sources. All are believed to be representative. These values are not intended for use in establishing maximum, minimum, or ranges of values for specification purposes. It is the sole responsibility of the users to investigate whether any existing patents are infringed by the use of the materials mentioned in this publication.