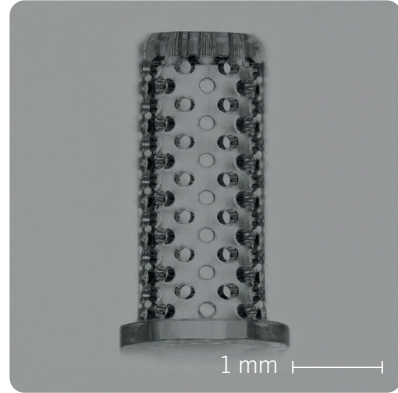




# UPquartz

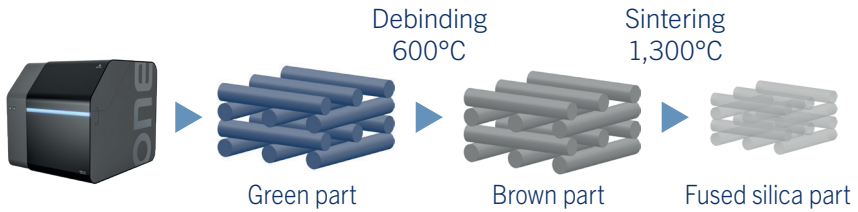
## 2-photon silica slurry

UpNano has developed a nanocomposite slurry for manufacturing fused silica ( $\text{SiO}_2$ ) parts using 2-photon polymerization, in cooperation with Glassomer. Printed green parts are converted into fused silica by thermal debinding and sintering. After high-temperature treatment, the 2PP-processed parts exhibit the characteristic properties of fused silica glass.



Bending strength	115 MPa
Density	2.2 g/cm <sup>3</sup>
Vickers hardness	980 HV
Thermal expansion $\alpha_{30-500}$	$0.56 \times 10^{-6} \text{ K}^{-1}$
Abbe number	67.8
Contact angle – H <sub>2</sub> O	36°
UV transmission at 200 nm*	>84%
Refractive index at 589 nm	1.4589

\* Sample thickness 1 mm



This specifically tailored 2PP material enables the production of  $\text{SiO}_2$  parts with bulk volumes in the mm- and features in the  $\mu\text{m}$ -range. Leveraging the remarkable characteristics of fused silica, including its exceptional thermal and chemical resistance, superb mechanical properties, high optical transmission, and inertness, UpQuartz opens the door for applications in which polymers cannot be applied.

The material consists of dispersed  $\text{SiO}_2$  nanoparticles in a polymerizable binder matrix. First, UpQuartz is 2PP printed to obtain the polymeric green part. Next, the green part is thermally debound at  $600^\circ\text{C}$  to remove the polymer matrix and subsequently sintered to fully dense fused silica at  $1,300^\circ\text{C}$ . During this process, the part undergoes isotropic shrinkage (28%) due to fusing of the  $\text{SiO}_2$  particles.

