Sinter-Free Low-Temperature 3D-Printing Of Nanoscale Optical Grade Fused Silica Glass

Tech ID: 33450 / UC Case 2022-969-0

BRIEF DESCRIPTION

Researchers at UC Irvine have developed a new method to 3D-print free-form silica glass materials which produces products with unparalleled purity, optical clarity, and mechanical strength under far milder conditions than currently available techniques. The novel processing method has potential to radically transform microsystem technology by enabling development of silica-based microsystems.

SUGGESTED USES

- Micro-optics and photonics, including ultra-compact imaging systems.
- Microelectromechanical systems (MEMS) and microfluidic devices.
- Biomedical devices, such as advanced endoscopes and sensors.
- Research applications in materials science and fracture mechanics.
- Potential use in the aerospace, medical, electronics, and specialty glass manufacturing industries.

ADVANTAGES

- Low-temperature processing at 650 °C, significantly reducing thermal constraints.
- High spatial resolution and optical quality suitable for nanophotonics.
- Improved mechanical properties and environmental stability of the printed objects.
- Enables the integration of silica glass structures with sensitive materials.
- Facilitates the creation of complex, free-form micro and nanostructures.

FULL DESCRIPTION

3D-printing free-form products from silica glass is highly desirable due to silica glass' superior physical and chemical properties. However, preparation of these materials is hindered by current processing methods which involve extremely high temperatures and air-free conditions. Since most microsystems include additional materials, like metals or semiconductors, which melt at much lower temperatures than the current required temperatures for conventional silica glass processing methods, silica glass has not generally been used in microsystem technologies.

Researchers at UC Irvine have invented a new method to 3D-print silica glass which avoids sintering and significantly lowers the processing temperatures. This novel processing method leads to silica structures with four-fold improved resolution, superior purity, and improved mechanical strength. Critically, the silica glass is now processed at lower temperatures than the melting points of many microsystem materials, opening the door for development of silica-based microsystems.

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OTHER INFORMATION

CATEGORIZED AS

- **Optics and Photonics**
  - All Optics and Photonics
- **Materials & Chemicals**
  - Ceramics
  - Chemicals
  - Polymers
- **Nanotechnology**
  - Electronics
  - Materials

STATE OF DEVELOPMENT

A working prototype of this invention has been prepared and is ready to scale up for commercial use.

PATENT STATUS

Country	Type	Number	Dated	Case
Patent Cooperation Treaty	Published Application	WO 2023/215638	11/09/2023	2022-969

RELATED CASES

2022-969-0

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