SYSTEM AND METHOD FOR TOMOGRAPHIC FLUORESCENCE IMAGING FOR MATERIAL MONITORING

Tech ID: 33281 / UC Case 2024-013-0

PATENT STATUS

Country	Type	Number	Dated	Case
Patent Cooperation Treaty	Published Application	WO2025/038880	04/03/2025	2024-013

Additional Patent Pending

BRIEF DESCRIPTION

Volumetric additive manufacturing and vat-polymerization 3D printing methods rapidly solidify freeform objects via photopolymerization, but problematically raises the local temperature in addition to degree-of-conversion (DOC). The generated heat can critically affect the printing process as it can auto-accelerate the polymerization reaction, trigger convection flows, and cause optical aberrations. Therefore, temperature measurement alongside conversion state monitoring is crucial for devising mitigation strategies and implementing process control. Traditional infrared imaging suffers from multiple drawbacks such as limited transmission of measurement signal, material-dependent absorptions, and high background signals emitted by other objects. Consequently, a viable temperature and DOC monitoring method for volumetric 3D printing doesn't exist.

To address this opportunity, UC Berkeley researchers have developed a tomographic imaging technique that detects the spatiotemporal evolution of temperature and DOC during volumetric printing. The invention lays foundations for the development of volumetric measurement systems that uniquely resolve both temperature and DOC in volumetric printing.

This novel Berkeley measurement system is envisaged as an integral tool for existing manufacturing technologies, such as computed axial lithography (CAL, Tech ID #28754), and as a new research tool for commercial biomanufacturing, general fluid dynamics, and more.

SUGGESTED USES

- Volumetric and Vat-polymerization additive manufacturing
- Computed Axial Lithography (see BK-2017-197)
- Commercial and academic research, e.g., biofabrication, biomanufacturing, and fluid dynamics

ADVANTAGES

- Measures temperature without relying on easily-blocked infrared spectrum measurements
- Accessible approach using commodity/off-the-shelf components and simple assembly (no complex domain knowledge)
- Options for both widely-available commercial and custom research materials

RELATED MATERIALS

RELATED TECHNOLOGIES

▶ Computed Axial Lithography (CAL) For 3D Additive Manufacturing

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OTHER INFORMATION

CATEGORIZED AS

» **Optics and Photonics**
» All Optics and Photonics
» **Engineering**
» Engineering
» Other
» **Imaging**
» 3D/Immersive
» Other
» **Materials & Chemicals**
» Biological
» Polymers
» **Medical**
» Other
» **Research Tools**
» Other

RELATED CASES

2024-013-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Computed Axial Lithography (CAL) For 3D Additive Manufacturing
- Roll-To-Roll Based 3D Printing Through Computed Axial Lithography
- High Fidelity 3D Printing Through Computed Axial Lithography
- A New Method for Chemically Recycling Dicyclopentadiene Thermosets

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