

MOLD-FREE FABRICATION OF ULTRAFAST AND HIGHLY SENSITIVE FLEXIBLE PRESSURE SENSOR USING OCVD AND 3D PRINTING

Mold-free oCVD/3D-printed pressure sensors provide ultrafast, flexible, low-cost sensing across wide ranges.

Pressure sensors are critical components for robotics, medical devices, and more but are limited by narrow pressure ranges and surface geometries. Flexible pressure sensors are typically fabricated through a complicated and expensive photolithographic process to manufacture a rigid mold first and subsequent mold-pattern transfer to a flexible substrate. This typical process suffers from issues such as large time-intensity, high manufacturing cost, and limited sensing capability. To address these issues, researchers at Purdue University have developed a mold-less fabrication method for flexible pressure sensors using high-resolution 3D printing with multi-scale geometries and nanoscale oCVD polymers that conformally coat the multi-scale geometries. The resulting sensor is flexible enough to wrap across curved surfaces while maintaining high sensitivity across both low (0.7 - 10 kPa) and high (10 - 100 kPa) pressure domains. The developed pressure sensor manufacturing strategy, eliminating photolithographic processes and additional pattern transfer enables significantly lower manufacturing costs. This technology has applications for pressure sensors mounted to curved or irregular surfaces that still require fast response and high sensitivity across a wide range of pressures.

Advantages

- Flexible pressure sensors
- Mold-less fabrication
- Lower manufacturing costs compared to traditional pressure sensors
- Easy to customize and switch sensor design
- Ultrafast and highly sensitive
- Can detect pressure across wide range

Technology ID

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Category

Computing/Internet of Things
(IoT)

Automotive & Mobility

Tech/Micromobility & Smart

Urban Infrastructure

Chemicals & Advanced

Materials/Materials Processing &

Manufacturing Technologies

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- Multi-dimensional scales of fabrication demonstrated

Applications

- Robotics
- Medical Devices
- Automotive
- Industrial automation

Technology Validation:

This technology has been validated through fabrication and testing of the flexible pressure sensors. Testing showed an ultra-fast response time of 38 us with a high sensitivity of 160-190 kPa⁻¹ for both low pressure and high-pressure domains.

TRL: 4

Intellectual Property:

Provisional-Patent, 2023-04-12, United States

PCT-Gov. Funding, 2024-04-12, WO

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