MULTILAYER POUCH ROBOT AND MANUFACTURING METHOD

Tech ID: 33634 / UC Case 2024-162-0

PATENT STATUS

Country	Type	Number	Dated	Case
Patent Cooperation Treaty	Published Application	WO 2026/080640	04/16/2026	2024-162

BRIEF DESCRIPTION

Inflatable pouches are attractive as actuators and structural links in soft robots due to their low deflated profile and high deformation ratio. Particularly compelling for minimally invasive surgery, deflated robots/actuators may be deployed in small form factors and maneuver delicately in tight spaces once inflated. However, current fabrication methods do not readily scale for production of actuators with less than 1 mm feature sizes; they often require precision handling of separator films; and/or there are limited multilayer integration capabilities. Fully miniaturized, high degree-of-freedom surgical pouch robots and actuators have not yet been realized.

To overcome these challenges, UC Berkeley researchers have developed a rapid, monolithic, and scalable manufacturing method for fabricating thin-film-based pneumatic pouch soft robots. Small features (less than 0.3 mm) can be patterned at high speeds and using commercially available manufacturing tools while maintaining film planarity. Resulting robots can have complex, multilayer structures including single- and bi-directional joint actuators, structural links, integrated in-plane air channels, through-holes for interlayer connectivity, and air inlets to a supply manifold—from a single integrated processing step. Researchers have demonstrated a miniature four finger hand which can dexterously manipulate a cube (8 degrees of freedom), as well as an 10 degree-of-freedom planar arm with a gripper which can maneuver around obstacles. Entire pouch robot structures can have un-inflated thickness of less than 300 um and be inherently soft, allowing the robots to be used in tight spaces with fragile tissues for surgical applications.

SUGGESTED USES

- Minimally invasive surgery
- Producing high degree-of-freedom, miniature thin-film pneumatic soft pouch actuators

ADVANTAGES

- Single integrated processing step for manufacturing complex, multi-layer soft actuators with small (sub-0.3 mm) features
- Deflated thickness less than 300 um
- High degree-of-freedom gripper demonstrated for maneuvering around obstacles

RELATED MATERIALS

» Multi-Layer LDPE Pouch Robots Enabled by Inkjet-Printed Masking Layers - 10/10/2024

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OTHER INFORMATION

CATEGORIZED AS

» **Biotechnology**
» Health
» Other
» **Medical**
» Devices
» Disease: Autoimmune and Inflammation
» Disease: Cancer
» Disease: Central Nervous System
» Disease: Dermatology
» Disease: Digestive System
» Disease: Musculoskeletal Disorders
» Disease: Ophthalmology and Optometry
» Disease: Respiratory and Pulmonary System
» Other
» **Research Tools**
» Other

RELATED CASES

2024-162-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Printable Repulsive-Force Electrostatic Actuator Methods and Device
- Locomotion Device and Methods and Related Software
- Compact Series Elastic Actuator Integration

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