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No-Assembly Devices for Microfluidics Inside a Cavity

Tech ID: 22087 / UC Case 2011-819-0

SUMMARY

UCLA researchers have developed a method to fabricate electrowetting microfluidic devices without assembly of their subcomponents.

BACKGROUND

Current microfluidic devices having a cavity configuration with multiple electrodes must have their components separately fabricated and subsequently assembled (e.g., bonded, clamped) in order to form a cavity. For example, fabrication of a "parallel-plate" electrowetting-on-dielectric (EWOD)-based device commonly involves photolithographic patterning of electrodes on one or both plates, followed by a coating of thin-film dielectric, manual alignment, and bonding of the plates using a spacer. The assembly step is not suitable for batch fabrication. Also, assembled devices require large tolerances in cavity dimensions leading to significant error in droplet volumes.

This invention enables scalable production of microfluidic devices without assembling the subcomponents. Also, the no-assembly process produces cavities of precise dimensions making it particularly suitable for designs requiring smaller fluid volumes (e.g., sub-nanoliter volumes) with high accuracy.

INNOVATION

Researchers at UCLA have developed a method to fabricate microfluidic devices monolithically without assembly of subcomponents by using a surface micromachining process.

APPLICATIONS

- ▶ Fabrication of microfluidics devices for small and precise fluid volumes
- ▶ Quick and low-cost fabrication of microfluidic devices

ADVANTAGES

- ▶ Reduce or eliminate assembly steps
- ▶ Scalable production
- ▶ Accurate delivery of liquid volumes (sub-nanoliter volumes)

STATE OF DEVELOPMENT

An EWOD-based digital microfluidic device has been experimentally validated by performing all core microfluidic droplet operations (i.e., creation, transport, division, and addition of droplets). The device has performed these core operations using aqueous droplets (~100 picoliters) in air and oil.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	8,883,014	11/11/2014	2011-819

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ [Membraneless Fuel Cell with Self-Pumped Fuel and Oxidant](#)

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OTHER INFORMATION

KEYWORDS

Diagnostic, microfluidic

CATEGORIZED AS

- ▶ **Medical**
 - ▶ Delivery Systems
 - ▶ Devices
 - ▶ Diagnostics
 - ▶ Research Tools
- ▶ **Sensors & Instrumentation**
 - ▶ Biosensors

RELATED CASES

2011-819-0

- ▶ Methods of Restoring and Maintaining Gas Film on Superhydrophobic Surfaces while Underwater
- ▶ A Low-Profile Flow Shear Sensing Unit
- ▶ Complete Transfer of Liquid Drops by Modification of Nozzle Design
- ▶ Stereo Image Acquisition By Lens Translation
- ▶ Method of Fluid Manipulation By Electrodewetting
- ▶ Method for Commercial Production of Super-Hydrophobic Materials
- ▶ A Built-In Mechanism Of Gas Maintenance In Microfeatures On A Submerged Surface
- ▶ Liquid-Repellent Surfaces Made of Any Materials
- ▶ On-chip, Real-time Feedback Control for Electrical Manipulation of Droplets
- ▶ Micropumping of Liquids by Directional Growth and Selective Venting of Bubbles
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