Digital Meter-On-Chip with Microfluidic Flowmetry

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ABSTRACT

Researchers at the University of California, Davis have developed a microfluidic flowmetry technology that achieves on-chip measurement with ultrahigh precision across a wide tunable range.

FULL DESCRIPTION

Accurate monitoring and control of liquid flows at very low rates is essential in a wide range of applications – including biomedical analytics and industrial monitoring. Current technologies employ mostly thermal flowmeters, which use calorimetric sensing mechanisms. While common, these thermal flowmeters present drawbacks that include additional calibration/compensation steps, potential fluid contamination and thermally-induced changes to the molecular properties of the fluids being analyzed. Thus, innovations in microfluidic sensors that measure accurately and precisely are highly desired.

This device is the first, on-chip, digital, flow-measuring device – frequently referred to as a digital meter-on-chip (DMC). The device's simple architecture permits the digitization of flow governed by capillary action - without relying on gravity, requiring external energy use, or bulky control equipment. Additionally, a convenient, non-contact, wireless, optical detection scheme using a smartphone can be deployed as the readout module in conjunction with the DMC. This technology can be easily incorporated into existing microfluidic designs. It offers a versatile, low-cost option for drug delivery, biomedical analysis, and a variety of other applications.

APPLICATIONS

- On-chip and local microflow assessments deployable across multiple medical and other fields
- Enables continuous flow into countable transferred liquid units at consistent quantifiable volumes

FEATURES/BENEFITS

- On-chip and localized microflow measurement with ultrahigh precision and wide tunable range
- Use of capillary action, instead of gravity, drop
- Integrates with a wide array of current fluidic devices
- Ultrahigh flow-to-frequency sensitivity and volume resolution (over 50 times the highest reported value with similar digital principle targeting ultralow flowrates)
- Highly compatible with and adaptive to conventional, PDMS-based, microfluidic devices

PATENT STATUS

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OTHER INFORMATION

KEYWORDS

flowmetry, measurement, microflow, microfluidic, digital meter-on-chip, capillary action

CATEGORIZED AS

- **Energy**
  - Other
- **Medical**
  - Diagnostics
- **Sensors & Instrumentation**
  - Analytical
  - Medical

RELATED CASES

2020-036-0

Patent Pending

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Micropatterned Superhydrophobic Textile for Enhanced Biofluid Transport
- Microfluidic Dispenser for Automated, High-Precision, Liquids Handling
- Digital Droplet Microflowmetry Enabled by Interfacial Instability
- Digital Droplet Infusion System for High-Precision, Low-Volume, Delivery of Drugs or Nutritional Supplements

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