Digital Droplet Microflowmetry Enabled by Interfacial Instability

Tech ID: 27460 / UC Case 2017-282-0

ABSTRACT

Researchers at the University of California, Davis have developed a non-thermal, digital microfluidic flowmeter with the ability to measure ultralow flow rates.

FULL DESCRIPTION

Fluid flow is often measured using a pitot tube to calculate the flow based on pressure gradient. This method is prone to false readings due to the binding of fluids and overall poor accuracy when used in conjunction with low flow rates. Alternatives include thermal flow sensors which, despite being more accurate, are limited in application due to: their inability to be used with heat-sensitive fluids (including biological fluids), non-linear nature over usage temperature range and susceptibility to fluid contamination and complexed fluid flow. Non-thermal alternatives are often expensive, difficult to make, and are unable to reach the same sensitivities as their thermal counterparts. This creates a need for a non-thermal fluid sensor that can achieve good sensitivity and accurate readings under low flow rates and volume conditions.

Researchers at the University of California, Davis have developed a non-thermal, digital microfluidic flowmeter that can achieve highly sensitive and accurate measurements of ultralow flow rates. The device uses resistive, rather than thermal, principles to quantify fluid flow. Made using existing microfabrication technology, the flowmeters are inexpensive and easy to make and can be interfaced with adaptive fluidic configurations for use in a diverse range of applications. The robust microflowmeter is scalable and has already been tested in a wearable textile-based prototype, measuring, in real-time, a range of 3-70 µL/min flow of continuous saline solution.

APPLICATIONS

- Real-time and continuous monitoring of physiological and/or pathological states of human body
- Drug delivery system
- Lab-on-a-chip monitoring of microfluidics
- High throughput screening

FEATURES/BENEFITS

- Adaptive fluidic configurations including:
- pluggable connections, in-line embedment to tubes, reversible integration with planar microfluidic chips
- 2D and 3D implementation
- Digital, high precision readouts
- Low cost production
- Low power consumption
- Measurement of pL to µL volumes
- Measurement of pL to µL/min flow rates
- No external driving mechanism
- Simple acquisition circuitry
- Simple device architecture
- Small dimensions and footprint (high portability and integrability)

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,900,818	01/26/2021	2017-282

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OTHER INFORMATION

KEYWORDS

droplet microfluidics, microflowmetry, interfacial instability, ultralow flow rate, non-thermal

CATEGORIZED AS

- **Biotechnology**
  - Other
- **Sensors & Instrumentation**
  - Analytical
  - Biosensors
  - Medical
  - Other
  - Physical Measurement
- **Engineering**
  - Other

RELATED CASES

2017-282-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Micropatterned Superhydrophobic Textile for Enhanced Biofluid Transport
- Microfluidic Dispenser for Automated, High-Precision, Liquids Handling
- Digital Droplet Infusion System for High-Precision, Low-Volume, Delivery of Drugs or Nutritional Supplements
- Digital Meter-On-Chip with Microfluidic Flowmetry

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