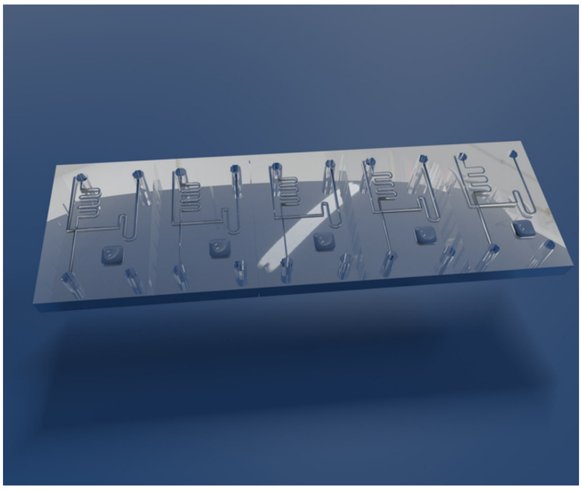
INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Marangoni Convection Driven by Micro-scale Thermal Sources and its Application to Single Molecule Detection - Marangoni Probes

TECHNOLOGY NUMBER: 3419



Technology ID
3419

Category
Hardware
Engineering & Physical Sciences
Semiconductors, MEMS, and Electronics

Inventor
Amar Basu
Yogesh B. Gianchandani

Further information
Joohee Kim
jooheek@umich.edu

View online

OVERVIEW

Reconfigurable lab-on-a-chip microfluidic devices using temperature-induced surface tension gradients

- Eliminates need for prefabricated, application-specific assay chips
- Mixed chemical analysis, single molecule detection, multiple biomedical assays

BACKGROUND

Traditional lab-on-a-chip microfluidic devices have revolutionized biomedical and chemical research by miniaturizing and integrating various analytical processes. Historically, each chip is designed and fabricated for a specific application, such as DNA sequencing, cell sorting, or chemical synthesis. While specialized chips meet intended needs, their application-specific nature limits versatility and increases costs. Reconfiguring these devices for different assays often requires creating entirely new chips, which is labor-intensive and expensive. The need for more adaptable devices has become increasingly evident as researchers seek more efficient, versatile, and cost-effective solutions. An improved method that allows real-time reconfiguration of chips without compromising performance would address these challenges, promoting broader and more flexible use in various scientific fields.

INNOVATION

Researchers at the University of Michigan have developed an innovative method to generate controlled flow in an unconstrained liquid film, eliminating the need for a patterned microchip. This technique leverages the Marangoni effect, where gradients in surface tension arise from thermal singularities, leading to high-speed flow patterns. By using microscale heat sources to induce controlled temperature variations on a thin liquid film's surface, researchers can precisely direct flow speed and geometry. This advancement allows for various flow patterns, such as doublets and toroids, which can trap, mix, and spin microdroplets. The technology enables the creation of reconfigurable microchips for multiple chemical analysis procedures, including single-molecule detection. This versatile approach promises significant advancements in biomedical research, chemical analysis, and diagnostic assays, offering a flexible, adaptable platform for various scientific applications.

ADDITIONAL INFORMATION

INTELLECTUAL PROPERTY:

US7358051 “Liquid flow actuation and suspension manipulation using surface tension gradients”