Lab-on-a-chip microfluidic microvalves

Tech ID: 33441 / UC Case 2020-635-0

BRIEF DESCRIPTION

A design for compact and energy-efficient microvalves for use in lab-on-a-chip microfluidic devices

SUGGESTED USES

·Lab-on-a-chip Microfluidic Devices: The compact and energy-efficient microvalves can be utilized in lab-on-a-chip devices for various applications such as medical diagnostics, environmental monitoring, and biochemical analysis.

·Efficient Production of Pairwise Combinations of Liquids: The method for efficiently producing pairwise combinations of liquids can be beneficial in chemical synthesis, drug discovery, and high-throughput screening processes.

·Manipulation of Microfluidic Droplets: The paraffin thermal microvalves enable precise control over the manipulation of microfluidic droplets within layered devices. This can be advantageous in applications requiring controlled mixing and reaction kinetics, such as DNA sequencing, PCR, and cell culture assays.

·Arraying and Mixing Droplets for Reactions: The invention simplifies the task of arraying large numbers of droplets into specific groups and mixing their contents together. This capability is particularly useful in genotyping reactions, where multiple sample-reagent pairs need to be combined in a controlled manner.

·Cost-Efficient Fabrication of Microvalves: The use of tissue sectioning instruments and methods for fabricating microvalves provides a cost-efficient alternative to traditional cleanroom microfabrication tools. This can lower the barrier to entry for researchers and companies developing microfluidic devices.

·Zero-Leakage Fluid Control: The paraffin thermal microvalves offer zero-leakage fluid control without requiring pressure differentials to open. This feature makes them suitable for applications where precise fluid handling and minimal cross-contamination are critical, such as medical diagnostics and drug delivery systems.

FEATURES/BENEFITS

·Improved Performance: The microvalves enhance the performance of lab-on-a-chip microfluidic devices by providing efficient fluid control and manipulation.

·Reduced Leakage: The zero-leakage valve design ensures minimal cross-contamination and improves the reliability of microfluidic experiments and assays.

·Simplified Workflow: The invention simplifies the workflow for arraying and mixing droplets for reactions, reducing the complexity and time required for experimental setup.

·Cost Savings: The cost-efficient fabrication method lowers the production costs of microfluidic devices, making them more accessible to researchers and industries.

·Versatility: The invention's versatility allows it to be applied across various fields, including biotechnology, pharmaceuticals, chemistry, and medical diagnostics.

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OTHER INFORMATION

KEYWORDS

Microfluidic devices, Phase-change microvalves, Lab-on-a-chip, Pairwise liquid combinations, Zero-leakage valve, Paraffin thermal microvalves

CATEGORIZED AS

» **Biotechnology**
  » Other
» **Research Tools**
  » Other
  » Reagents

·Innovative Technology: The use of phase-change materials and tissue sectioning instruments represents innovative technological advancements in the field of microfluidics, offering novel solutions to longstanding challenges.

RELATED CASES

2020-635-0

TECHNOLOGY DESCRIPTION

The invention described in the patent application presents a novel approach to microfluidic device technology, focusing on compact and energy-efficient microvalves for lab-on-a-chip applications. These microvalves utilize a phase-change material (PCM) membrane that transitions from a solid to a liquid state upon heating, enabling precise fluid control without leakage. The invention also introduces a method for efficiently producing pairwise combinations of liquids, simplifying tasks such as chemical synthesis and high-throughput screening. Additionally, the invention incorporates cost-efficient fabrication methods using tissue sectioning instruments, making microfluidic devices more accessible to researchers and industries. Overall, the invention offers improved performance, reliability, and versatility in microfluidic applications across various fields.

STATE OF DEVELOPMENT

Prototype

RELATED MATERIALS

» Microfluidic phase-change membrane microvalves Elliot En-Yu HuiHinesh Vipul Patel - 05/18/2023

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	12,103,000	10/01/2024	2020-635

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