TECHNOLOGY

Microtube platform for the thermal automation of multi-step reactions

OVERVIEW

Background

The automation of laboratory processes generally leads to increased quality control, higher throughput, and reduced operating costs. In fact, the global market for products related to laboratory automation, specifically liquid handling, is projected to be $ 3.5 billion in 2019 at an annual growth rate of 8.3%. Diagnostic assays requiring liquid handling need to employ meticulous and stringent control measures in order to avoid contamination and sample loss. These challenges are often compounded when multiple complex steps are required within a given period of time. Microfluidic platforms have been deployed as portable systems to increase liquid processing times and contain liquids within these devices. However, they still require bulky peripheral benchtop equipment for their operation thus limiting their use in centralized laboratories and field applications that do not typically have specialized peripheral equipment. There remains a need for portable systems that can perform sensitive complex assays with multiple steps without the need of specialized bench top equipment.

Innovation

Researchers at the University of Maryland's Fischell Department of Bioengineering have developed an automated platform to perform multiple reaction steps within a single microtube by simply controlling temperature. Multiple reagent zones separated by temperature responsive phase changing materials are stacked within a single microtube. Incremental temperature adjustments will lead to the mixing of successive reaction zones. The features of this platform allow for the automation of complex assays involving multiple steps, avoids sample handling which reduces contamination, and employs fast assay processing times. Furthermore, the platform is highly adapt for use in settings that don't require specialized benchtop equipment; a simple hot water bath or thermocouple device is adequate for temperature control.

Advantages

- Faster processing times of complex assays thus increasing throughput
- Low operating costs - no specialized equipment is needed
- Minimum contamination due to elimination of sample transfer
- Highly portable and field deployable
- Compatible with central laboratory settings

Applications

- Nucleic acid based assays
- Heavy metal detection assays

Published article related to this work can be found here:
https://pubs.acs.org/doi/abs/10.1021/acs.analchem.7b05400

STAGE OF DEVELOPMENT

Prototype

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Additional Information

INSTITUTION

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PATENT STATUS

Pending

CATEGORIES

- Chemical
- Microfluidics
- Diagnostics

EXTERNAL RESOURCES

- https://pubs.acs.org/doi/abs/10.1021/acs.analchem.7b05400

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