

A disposable self-heating cartridge for point-of-care molecular diagnostics

A water-activated, self-heating, instrument-free microfluidic diagnostic cartridge

Inventors

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STATE OF DEVELOPMENT

Proof-of-concept and prototype developed with demonstrated utility of nucleic acid amplification and detection

INTELLECTUAL PROPERTY

[USSN 9,233,368](#)

REFERENCE MEDIA

Lu C. et al. [Lab on a Chip](#), 2011, 11(9), p. 1688-1693.

APPLICATIONS

- Cartridge for isothermal nucleic acid amplification and visual fluorescent or colorimetric detection
- Point-of-care diagnostic device
- Detect viruses, bacteria, and pathogens borne in bodily fluids

DESIRED PARTNERSHIP

License
Co-development

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Docket # X5912

Problem

Many molecular diagnostic devices require elevated temperatures to carry out biochemical reactions, such as those needed for nucleic acid amplification, including loop-mediated isothermal amplification (LAMP). The temperature is typically regulated with external electrical power, controller, and heating elements, which increases cost and complexity. Lateral flow immunoassays, while offering straightforward and rapid detection, suffer from low sensitivity and specificity.

Solution

Researchers in the Bau lab have developed a point-of-care microfluidic diagnostic cartridge that can amplify nucleic acids isothermally with high specificity. The device is integrated with an exothermic heater and temperature regulator that provides a steady temperature without needing external electric power. A porous paper strip determines the rate of water supply for heater activation, triggered by an exothermic reaction with a magnesium alloy. A phase-change material of paraffin is embedded in the cartridge to maintain the temperature at the desired level, i.e., 60°C-65°C for LAMP. The cartridge utility has been demonstrated by amplifying and detecting *E. coli* DNA using LAMP, detecting as few as 10 molecules in a sample.

Advantages

- Self-contained device without specialized instrumentation or electricity
- Maintain consistent desired temperature independent of ambient temperature
- Use in clinic, home, field, or resource-poor settings
- Low-cost disposable device

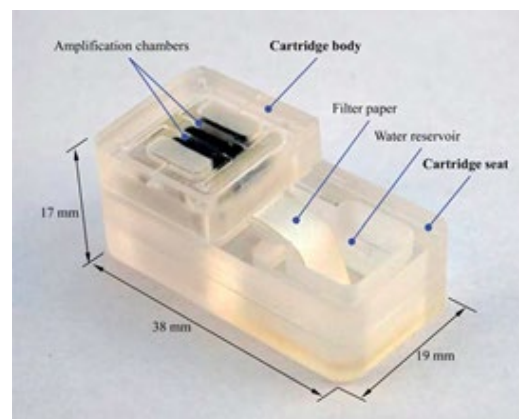


Image Caption: From Liu et al, 2011. Photograph of water-activated, self-heating, non-instrumented cartridge for isothermal amplification of nucleic acids.