

A membrane-based, high-efficiency microfluidic debubbler for point-of-care devices

Debubbler for microfluidic systems

Inventors

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STATE OF DEVELOPMENT

Proof-of-concept integration with bead array-based cassette and PCR microfluidics

INTELLECTUAL PROPERTY

UP application ([US20120245042 A1](#))

REFERENCE MEDIA

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

APPLICATIONS

- Debubbler for microfluidic applications, including nucleic acid amplification
- Degas fluid within fluidic systems

DESIRED PARTNERSHIP

License
Co-development

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Docket # X5843

Problem

Microfluidic devices often suffer from unwanted bubbles inside a channel, resulting in obstructed fluidic paths, lower reaction efficiency, detection distortion, and interference with bead array-based assays. Existing active debubblers that use pneumatics or vacuum to trap and dissipate bubbles require an external vacuum source, preventing portable device applications. However, passive debubblers rely on buoyancy or surface tension and do not provide sufficient degassing speed, especially when used in tandem with biological reagents.

Solution

Researchers in the Bau lab have developed a passive in-line microfluidic debubbler with a hydrophobic porous poly(tetrafluoroethylene) (PTFE) membrane that is permeable to gas but not liquid. There is a nozzle to direct the bubble-laden liquid toward the membrane. When there are no air bubbles flowing toward the membrane valve, liquid pressure lifts up the valve, allowing the liquid to pass through unobstructed toward the outlet of the device. When air bubbles migrate towards the valve, the air leaks through the membrane, reducing the line pressure and keeping the valve closed, forcing the bubble to discharge through the porous membrane to the external environment. The debubbler has been integrated with an agarose bead array-based microfluidic cassette and used to detect PCR amplicons of *B. cereus* bacteria.

Advantages

- High efficiency of bubble removal
- Rapid degassing
- No external vacuum required
- Compatible with microfluidics and multiple surfactants in solution

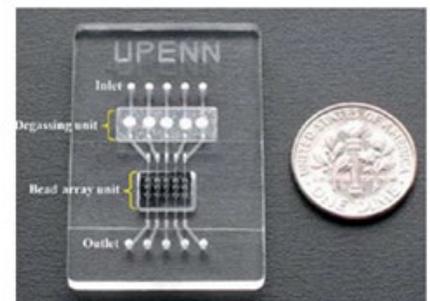
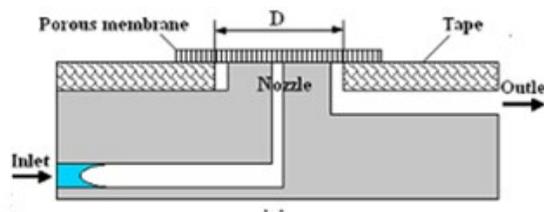


Image Caption: From Liu et al, 2011. On left, schematic depiction of debubbler. On right, bead array-based microfluidic cassette with integrated debubbler.