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Technology Transfer Office

Thermally Induced Single-Use Valves and Method of Use

Researchers at the University of South Florida have developed a low power single-use valve that is reliable and versatile for microfluidic applications.

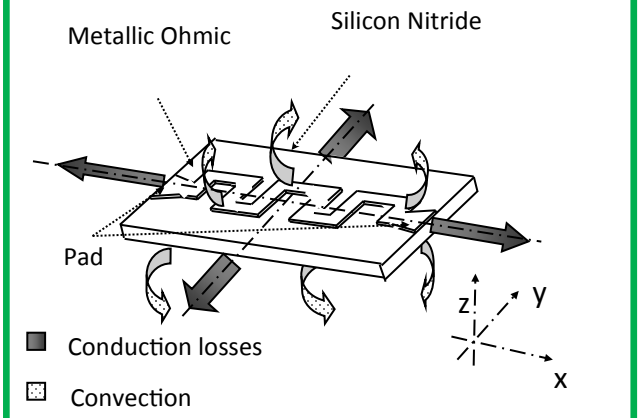
Advances in microfluidics technology are revolutionizing molecular biology procedures for enzymatic analysis, DNA analysis, proteomics and other biochemical system analyses. Common fluids used in microfluidic devices include whole blood samples, bacterial cell suspensions, protein or antibody solutions and various buffers. Only small volumes of these fluids, usually several nano-liters are required, which suggests that the amount of reagents and analytes used is also quite small. Hence, there is a need for valves that form an integral component for automated and controlled delivery of such fluids.

Researchers at USF have developed a single-use value that is cost effective and reliable. The valve consists of a metallic thin ohmic resistor patterned on a thin silicon nitride membrane which constitutes the flow barrier. Heating of the micro-patterned resistor via an electric pulse causes thermal stresses in the resistive membrane thus causing the valve to open. Well characterized processing steps are employed to achieve high yield. The fabricated valves are operated at different voltage requirements, which facilitate the interfacing with electronics that operate other subsystems. In addition, applications involving remote or unattended sensing have lower power and short operational time constant requirements to achieve longer operational life and fast actuation.

ADVANTAGES:

- **Requires low power**
- **Enables to be used passively as pressure induced break-valves**
- **Offers high reliability and versatility**
- **Cost effective**

Low Power Micro-Valves Offer High Reliability at Low Cost



A Top-down Schematic of the Silicon Membrane and a Patterned Resistor that Constitute the Single-Use Valve

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