

PIPES: Piezoelectric Instrument for Precision Exploration Sampling

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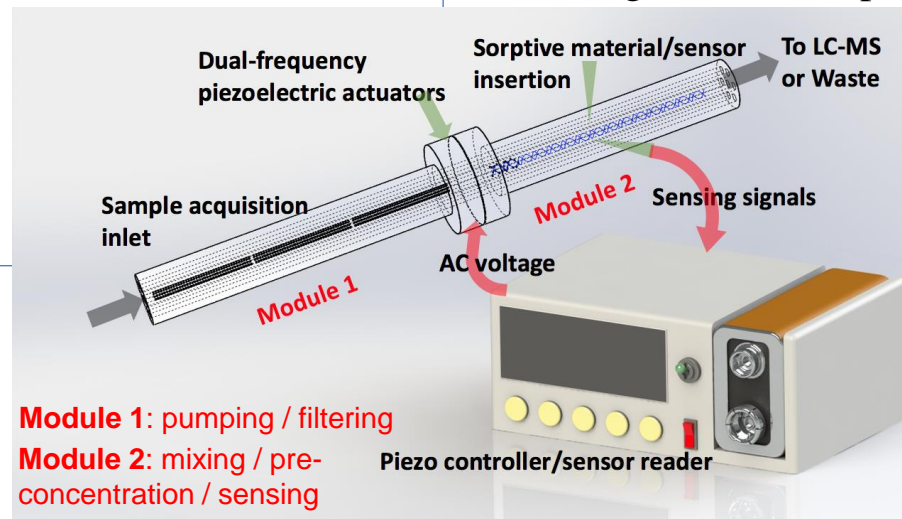
Approach

- Model and experiment on acoustic microstreaming and optimize it for pumping and mixing in PIPES
- Model and experiment on microbubble-induced trapping force and optimize it for solid particle removal in PIPES
- Build a nanosensor insertion for E Coli detection as a proof-of-concept of PIPES

Research Objectives

Objective: develop and demonstrate PIPES, a miniaturized liquid sampling system, for microorganism detection in water.

Innovation: Enabled by 3D printing, PIPES integrates acoustic actuation to achieve multiple sampling functions (e.g. pumping, filtering, and mixing) in one compact unit.



Start TRL: 2 (Principles published in papers)
End TRL: 3 (Proof-of-concept devices)

Potential Impacts

- PIPES as an integrated end-to-end in situ system will make sampling in space exploration more effective.
- The low-weight, low-cost and simple operation is particularly suitable for space exploration.
- PIPES as a versatile system that can work with multiple detection instrument systems has great crosscutting potential in biomedical and environmental applications.