AIRBORNE PARTICLE COLLECTION SYSTEM

- Handheld MEMS based fluidic system for biological agent detection -

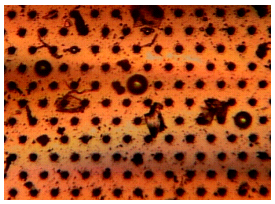
This work is supported by DARPA Microflumes

Joon Mo Yang

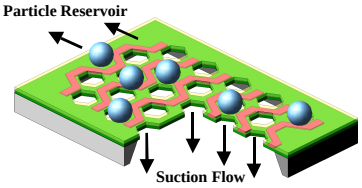
The objective of the present research is to collect micron-size airborne particles or biological agents in the air. In order to attain this goal, we design and fabricate an electrostatically active micro-filter using a MEMS fabrication technology. Basically, the micro-filter is a thin membrane (thickness = 1 ~ 3 μm) with an array of micron-size holes (hole diameter = 4 ~ 12 μm). On the membrane, 3-phase electrodes are deposited so that the captured particles are transported into liquid delivery system for biochemical analysis. Experimental and numerical studies are carried out, and we attain an efficient low-power particle filter. In order to demonstrate the airborne particle collection system, a fluid particle delivery system is developed using an inkjet printing technology. Ejection with high particle concentration is attained. We demonstrate the complete task from airborne particle seeding to particle collection in a facility designed and built for this purpose.

This system will be integrated with a cell preparation and a DNA identification system to build up a “Handheld MEMS based fluidic system for biological agent detection”.

(a) Micron-size particle seeding on the filter (micro-nozzle)

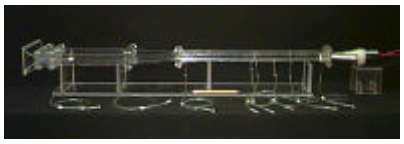


(b) Micro-size particle capturing (micro-filter)

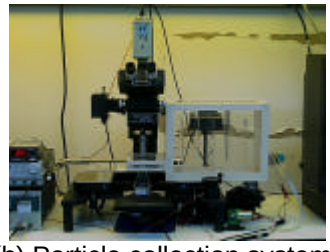


(c) Particle transport into the liquid delivery system (electrode deposited micro-filter)

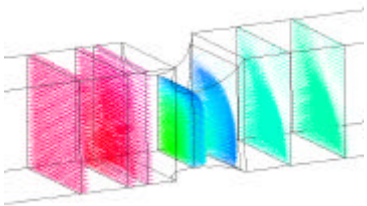
Three sequences in airborne particle collection



(a) Wind tunnel for power estimation



(b) Particle collection system



(c) Numerical calculation

Research tools for airborne particle collection