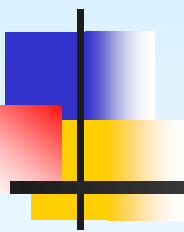
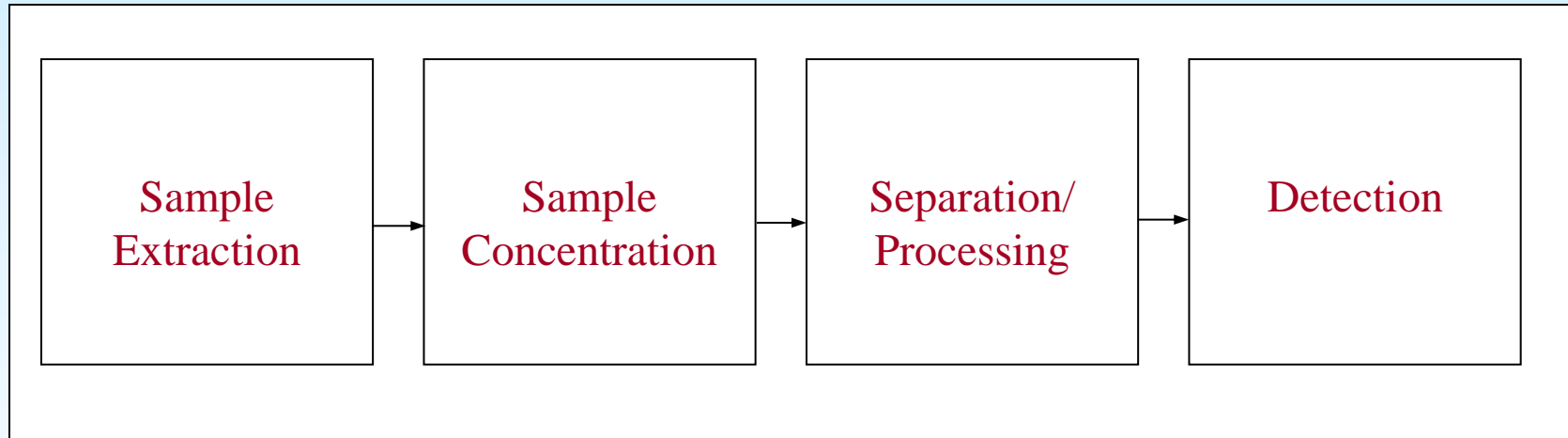
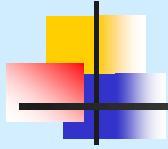


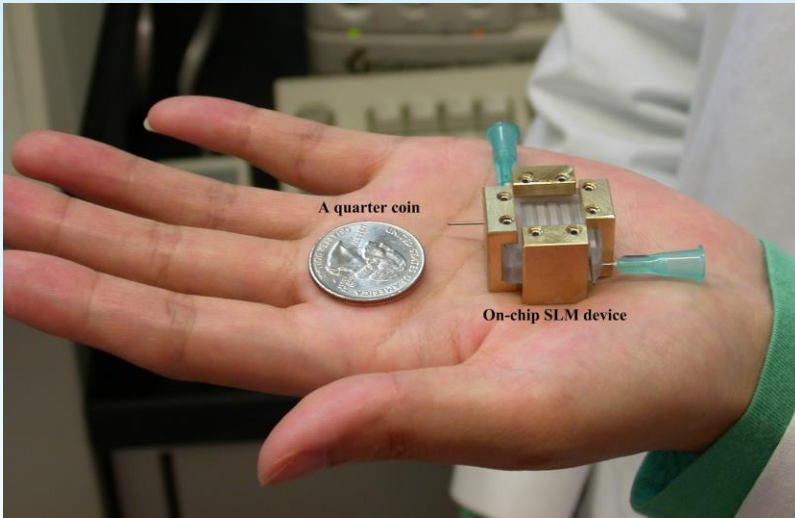
Lab On a Chip Devices for Water Analysis

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1. "Microfluidic supported liquid membrane extraction". X. Wang and S. Mitra. *Anal. Chim. Acta.* **2005**, 543, 92-98.
 2. "A sol-gel approach for fabrication of μ -SPE on PDMS micro channels". M. Karwa, S. Mitra and D. Hahn. *Anal. Chim. Acta.* **2005**, 546, 22-29.
 3. "A microfluidic hollow fiber membrane extractor for arsenic (V) detection." K. Hylton and Somenath Mitra, *Anal. Chim. Acta.*, **2008**, 607, 45-49.

Lab-on-a-chip, Total Analytical System

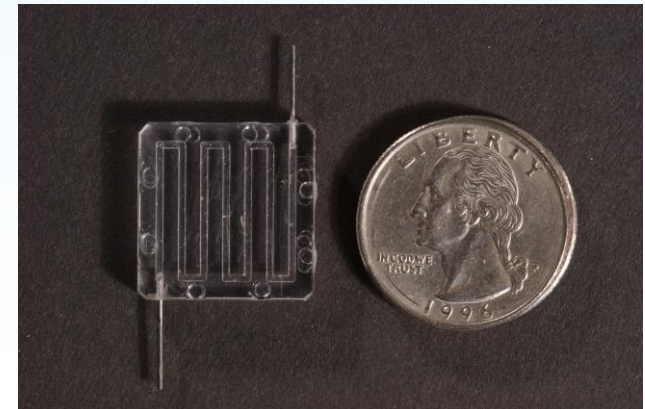


On-Chip SLMME



1. "Microfluidic supported liquid membrane extraction". X. Wang and S. Mitra. *Anal. Chim. Acta.* **2005**, 543, 92-98.

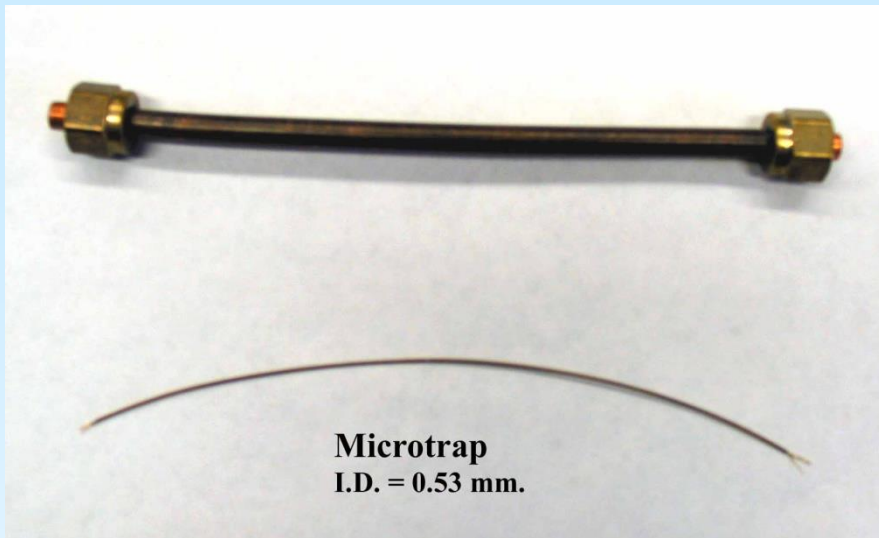
1. "A microfluidic hollow fiber membrane extractor for arsenic (V) detection." K. Hylton and Somenath Mitra, *Anal. Chim. Acta.*, **2008**, 607, 45-49.



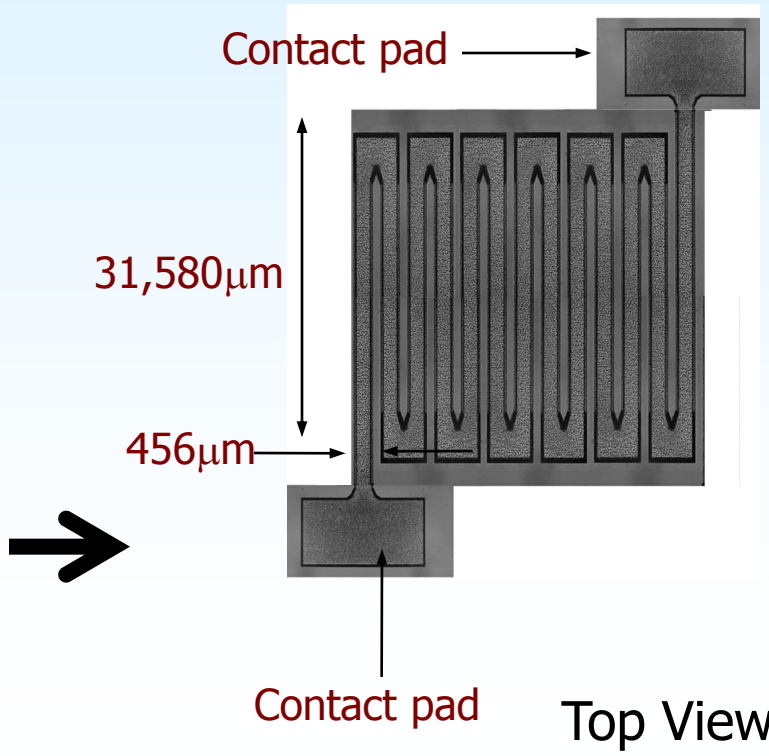
Silicon Micro Fabricated Micro-concentrator for Gas Sensing



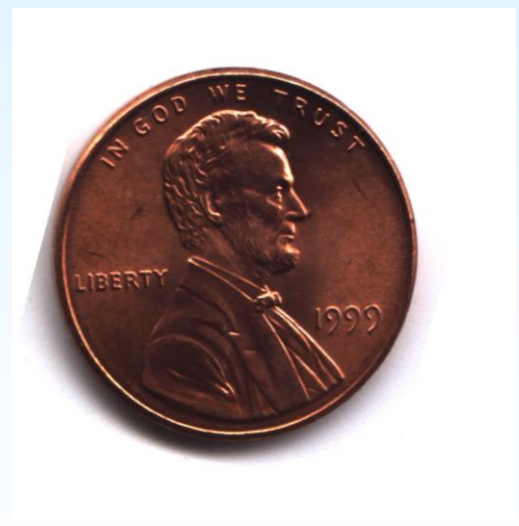
1. "Design and fabrication of microheaters for microfluidic channels". M. Kim, S. Mitra, S. Kishore, and D. Misra, *Sensors and Materials* **2006**, 18, 35-48.
2. "A microfabricated microconcentrator for sensors and gas chromatography". M. Kim and S. Mitra, *J. Chromatogr. A.* **2003**, 996 (1-2), 1-11.

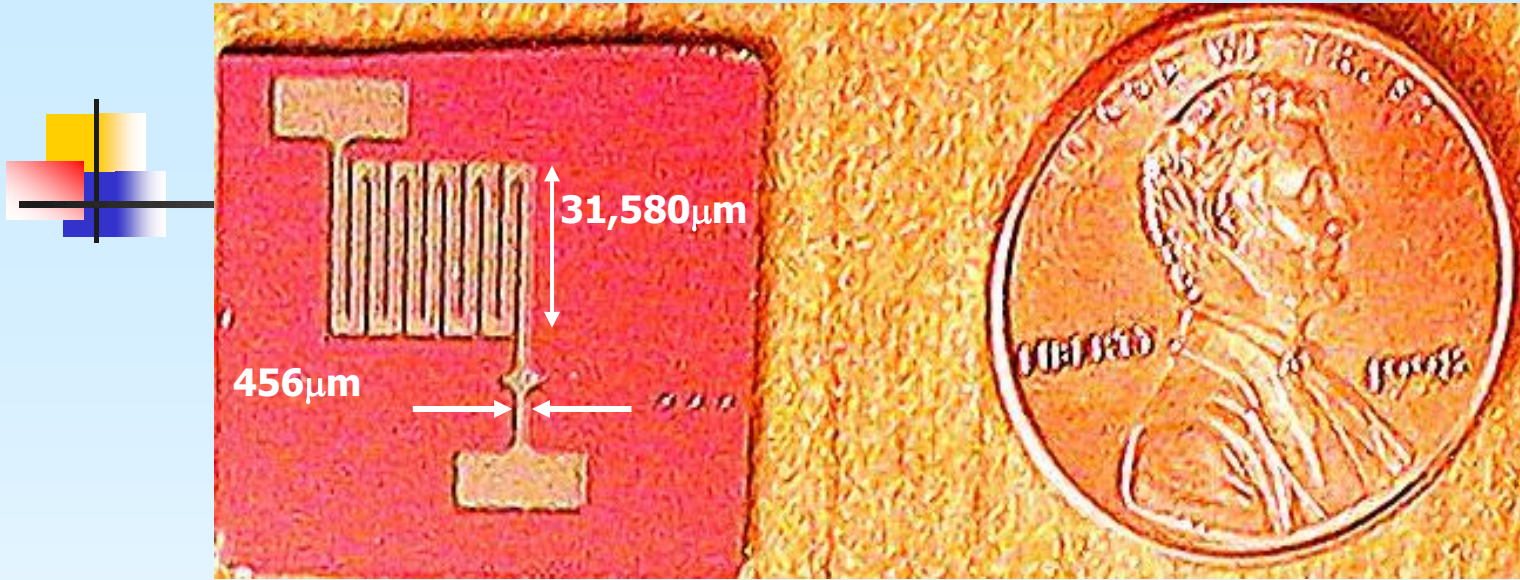


A conventional Sorbent Trap



A Micro fabricated Microconcentrator

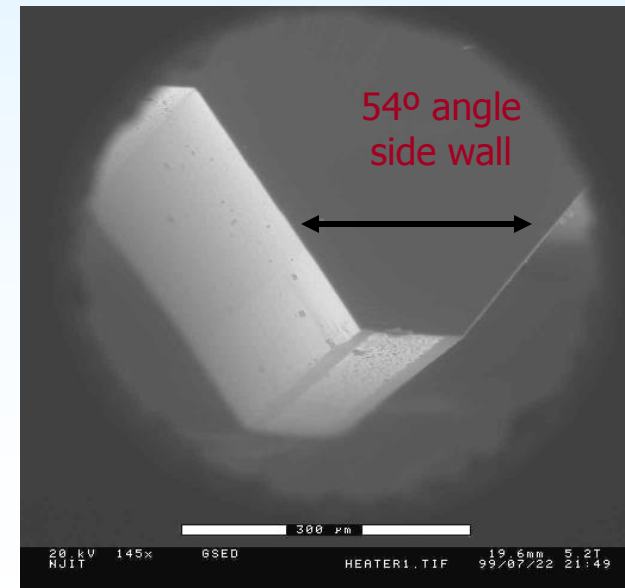




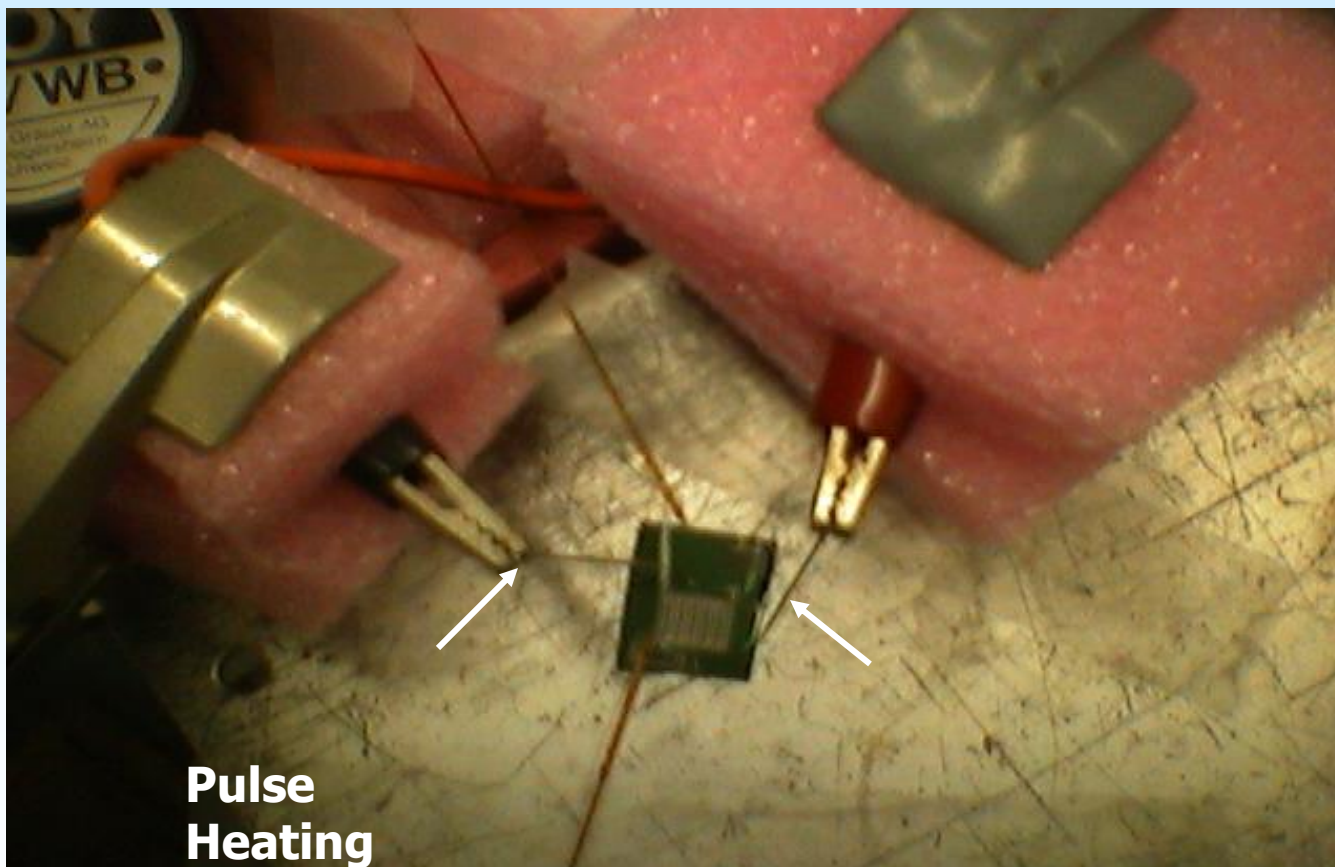
Crosssection View

"Design and fabrication of microheaters for microfluidic channels". M. Kim, S. Mitra, S. Kishore, and D. Misra, *Sensors and Materials* **2006**, 18, 35-48.

"A microfabricated microconcentrator for sensors and gas chromatography". M. Kim and S. Mitra, *J. Chromatogr. A* **2003**, 996 (1-2), 1-11.



Sample Out to Detector

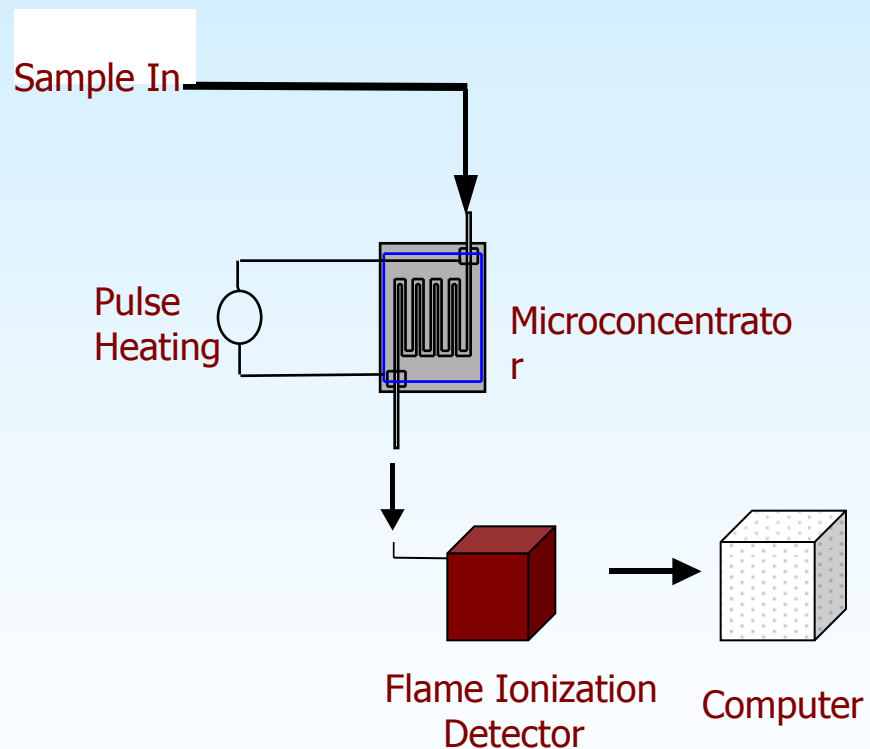
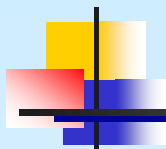


Pulse Heating

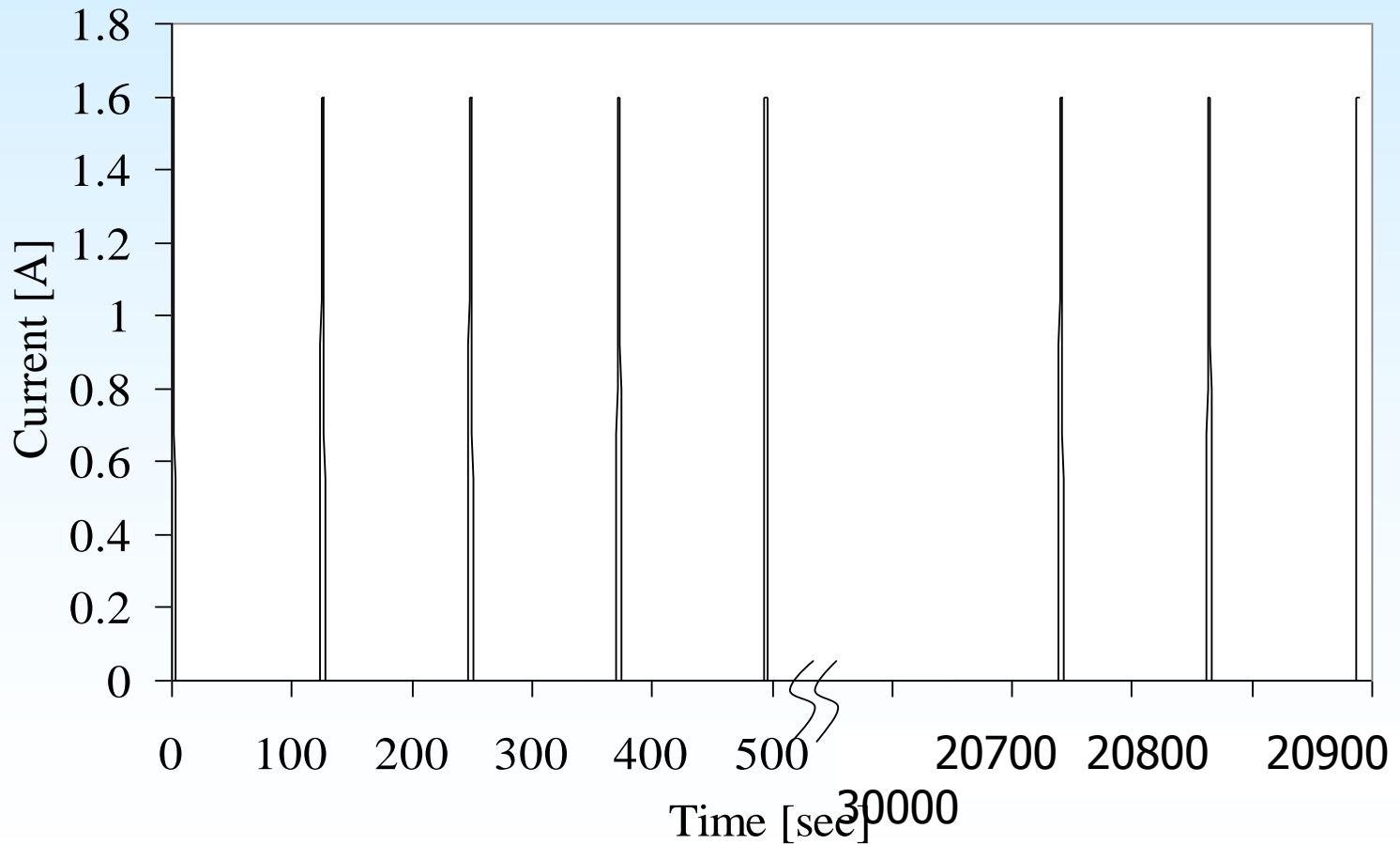
Sample In



Testing of the Microconcentrator Using Organic Vapors



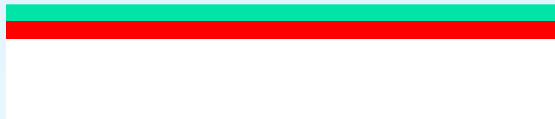
Thermal Stability Test: Pulsed for 3 seconds at Every 5 minutes Interval for 5 hours



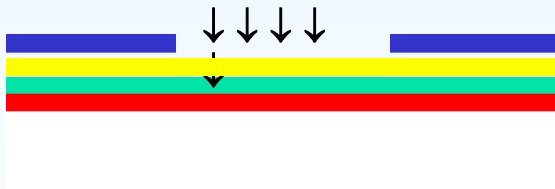
Microheater Fabrication Steps



- P-type, $\langle 100 \rangle$ oriented silicon wafer deposited with 2000 Å oxide



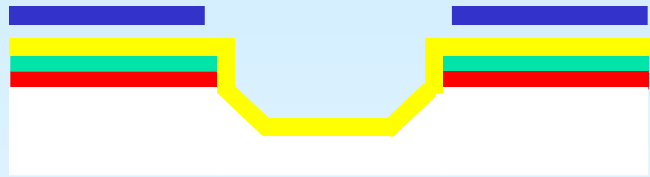
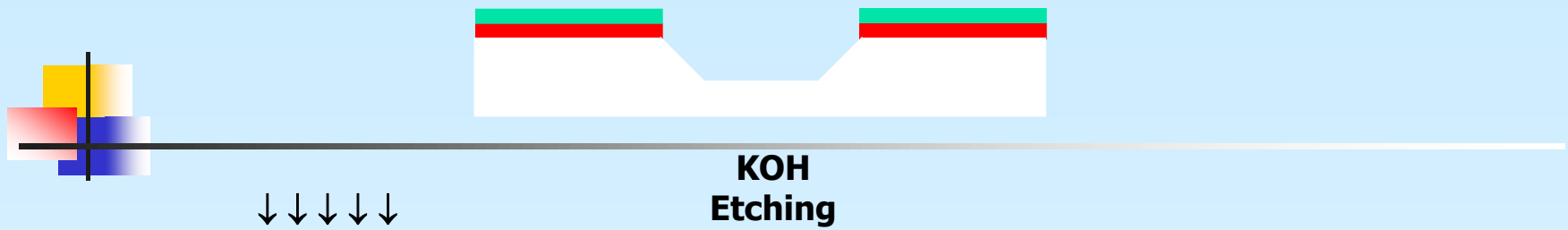
- 1500 Å Silicon Nitride deposited



- Patterning of Silicon nitride and oxide



- Reactive Ion Etching of Silicon nitride and oxide, PR strip



**Patterning for Ion
Implantation**



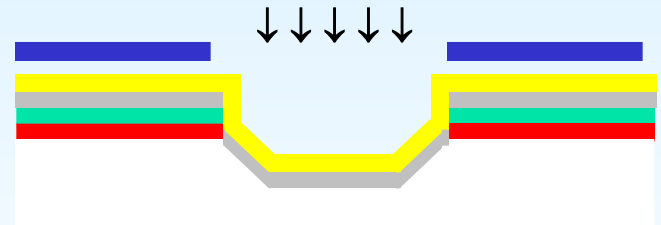
Boron Implantation of Silicon



Strip PR



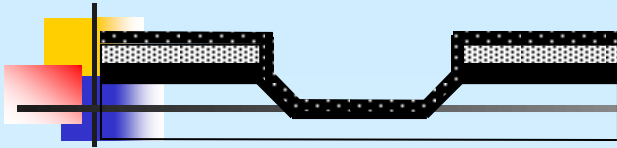
**Deposition of Aluminum
alloys**



**Patterning of aluminum
layer**



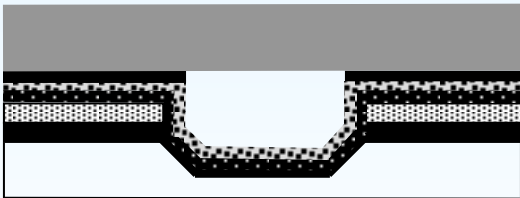
Strip PR



6. Spin-on-glass was coated

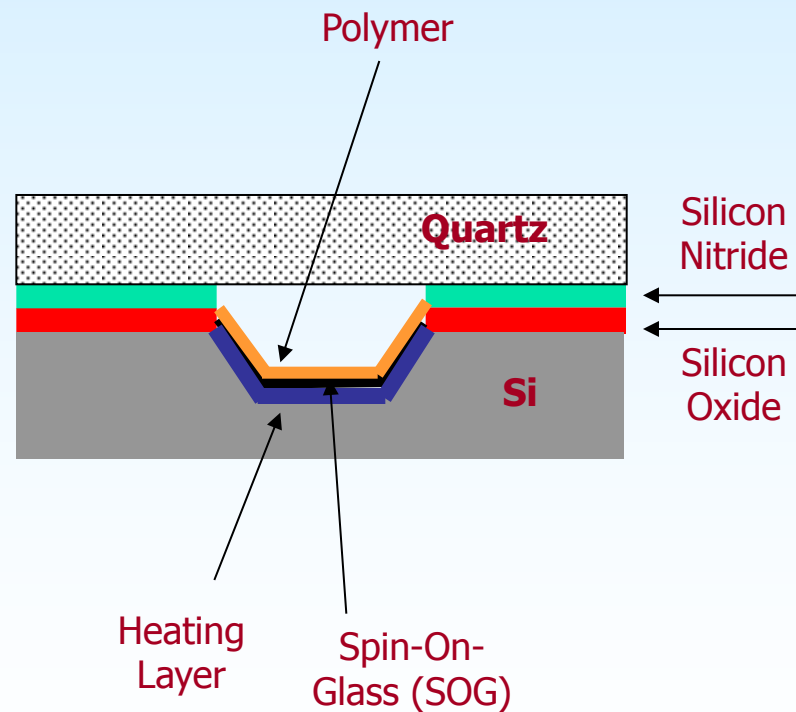
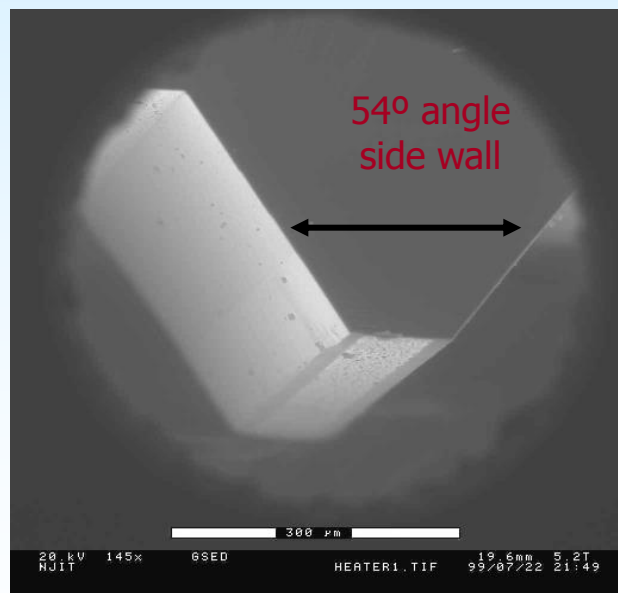


7. Polymer was coated

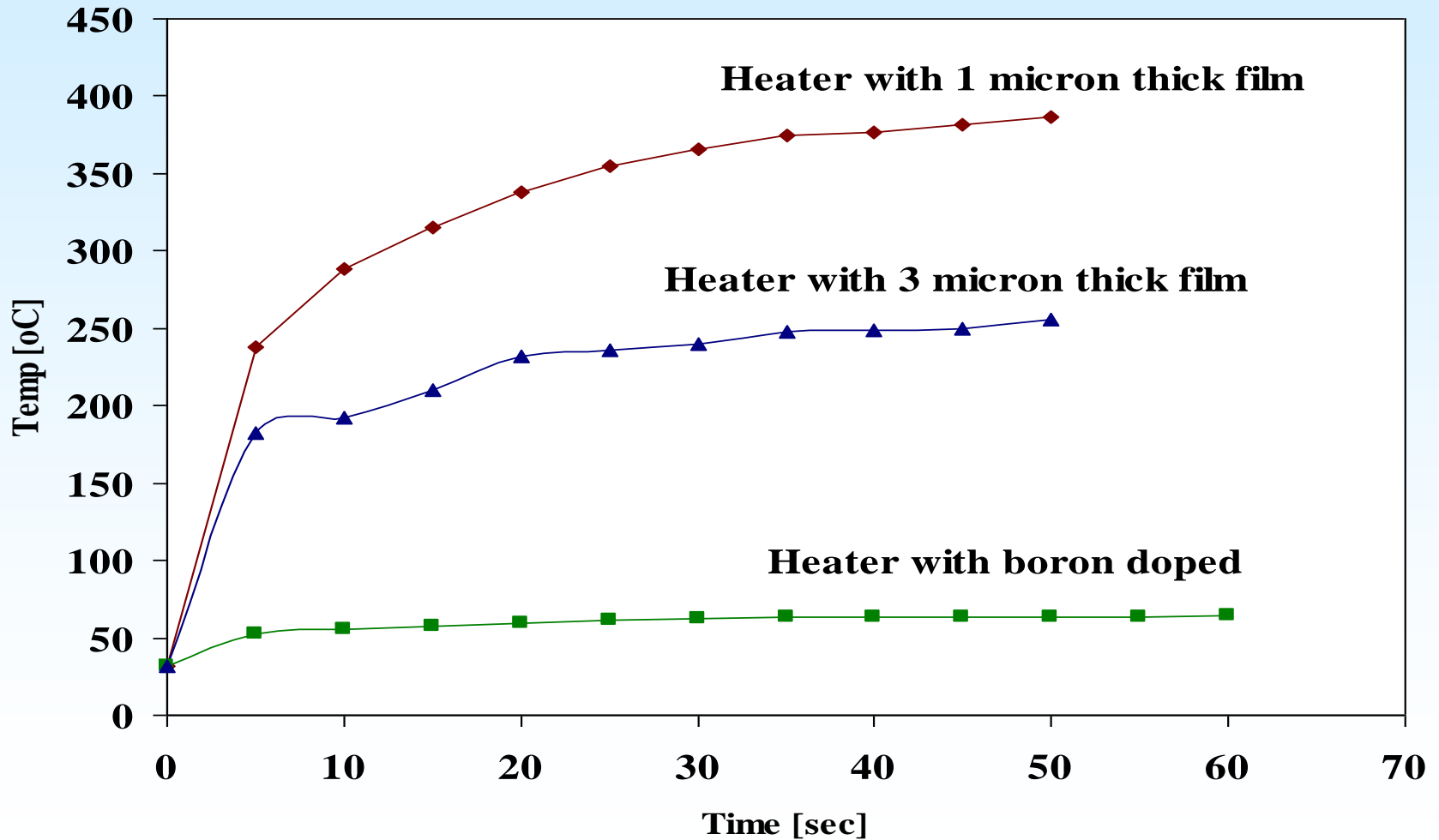


8. Bonding with quartz wafer using WaferGrip

SEM Image and Cross Section of the Anisotropically Etched Channel of the Microconcentrator



Temperature Characteristic of Heaters with Aluminum Film v.s. Boron Doped when 36V were applied



Temperature Profile of Heater With Al film with Various Voltages Applied

