A Fast Prototyping Process for Fabrication of Microfluidic Systems on Soda-Lime Glass

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Objectives

❑ Use soda-lime glass as the substrate materials.

❑ Develop the wet etching mask using AZ4620 photoresist.

❑ Develop a new etching process for soda-lime glass in HF based etchant.

❑ Develop a rapid and reliable fusion bonding process for soda-lime glass.

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Materials

□ Glass substrates:

- polished soda-lime glass (w/o annealing)

  (G-Tech optoelectronics Crop, Taiwan)

- microscope glass slides (anneal at 400 °C for 4 hr)

  (Marienfeld, Germany)

Both of the glass substrates were cleaned in boiling Piranha solution for 10 min.
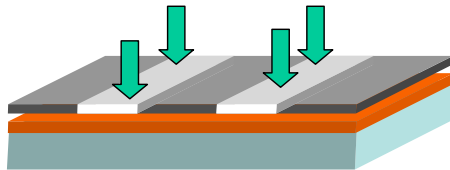
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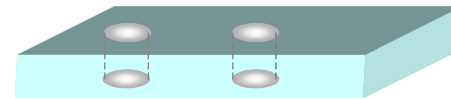**MEMS design and Micro-fabrication Lab**

Fabrication processes

AZ4620

PR spin-coating and soft baking

PR stripping

UV Exposure

Cover glass drilling

DI water film

Photoresist developing and hard baking
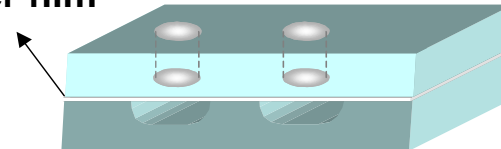
Cleaning and alignment

BOE etching in ultrasonic bath
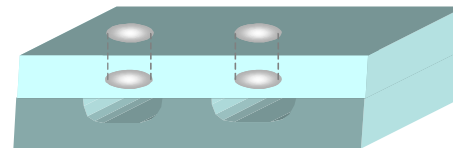
Fusion bonding

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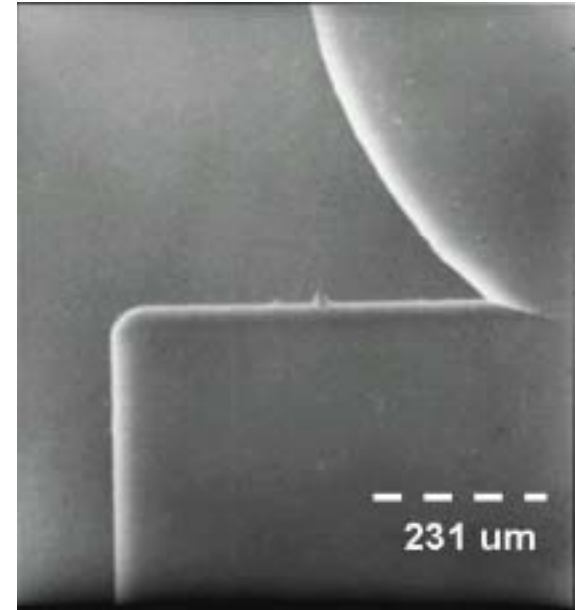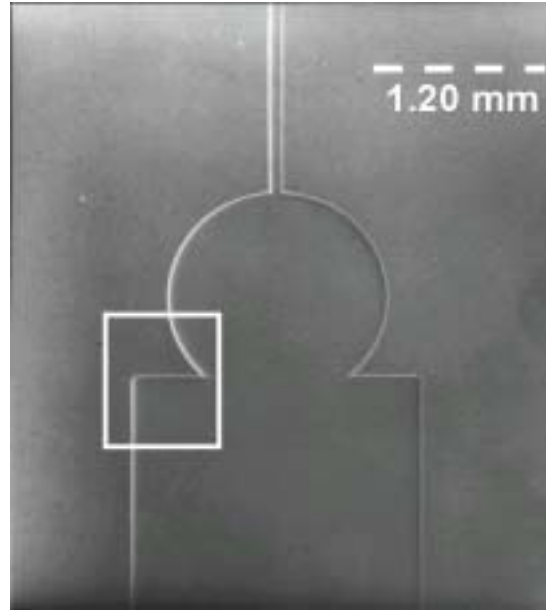**brication Lab**

SEM view of etched substrates
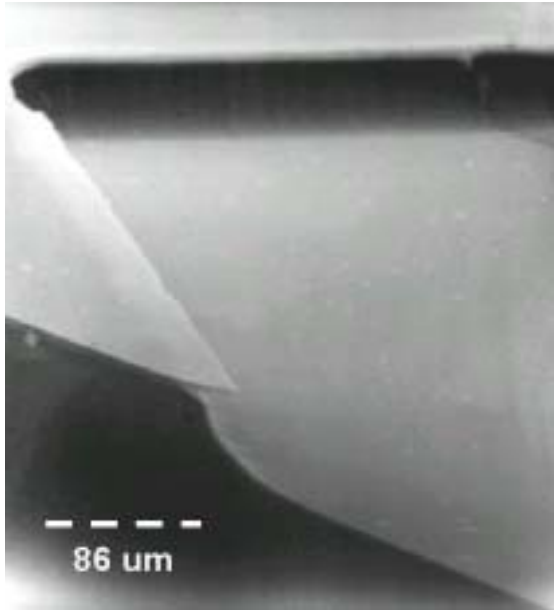
**AZ4620 etching mask   PR stripped   Close-up view of a
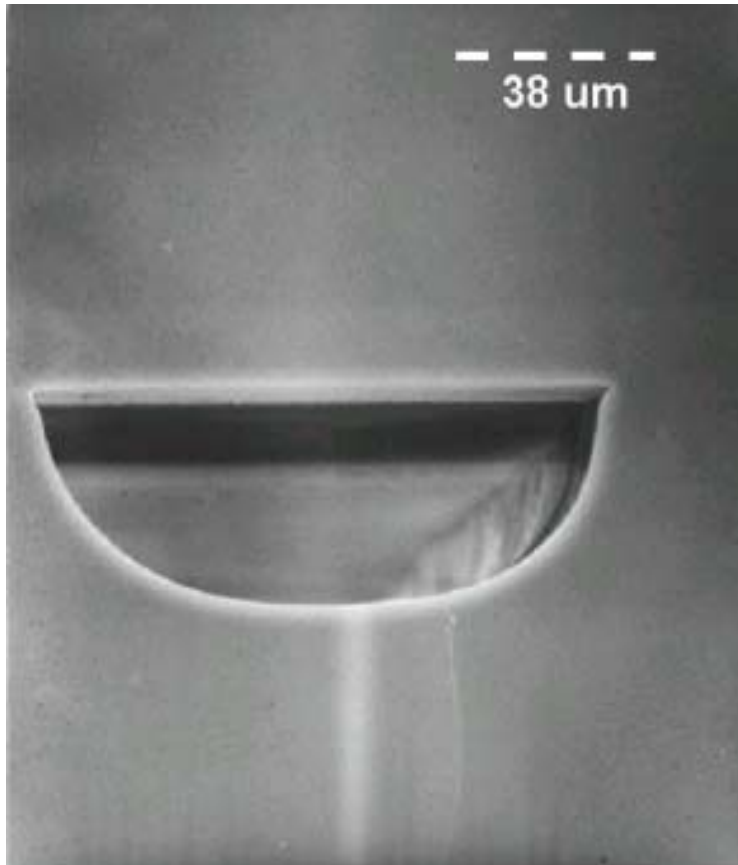   convex corner**

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Channel cross section after fusion bonding

38 um

- ❑ No Interface observed after fusion.
- ❑ No distortion occurred after fusion bonding
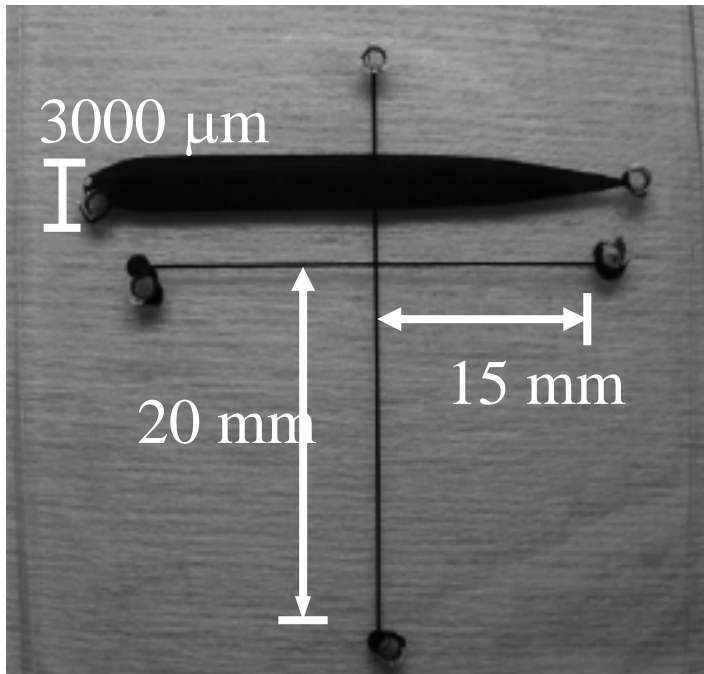- ❑ Ultrasonic agitation resulted in an isotropic etching channel.

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tching mask dimension: 20 μm

channel dimension: 36 μm deep, 92 μm wide

Microfluidic devices fabricated by the developed process

3000 μm

20 mm

15 mm

Flow-through sampling microchip

Flow cytometer

Micro CE chip

No collapse occurs at the 3 mm wide channel.
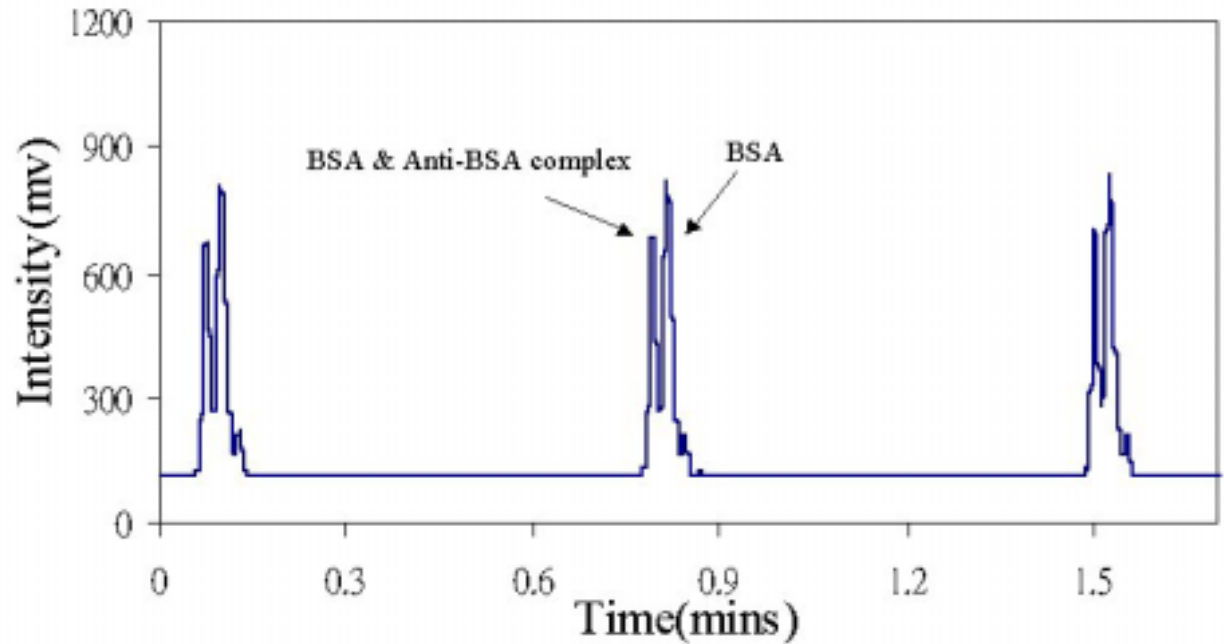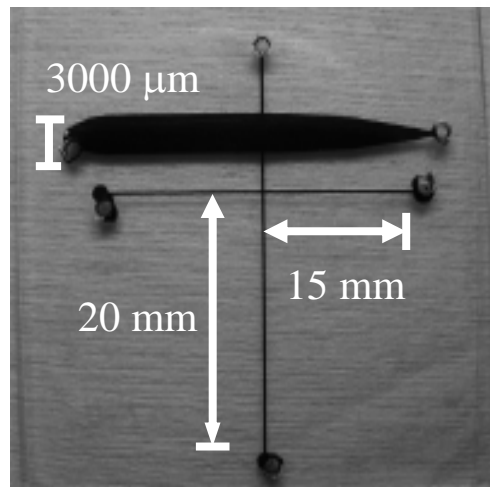
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Bioanalysis of a flow-through sampling microchip

Samples: Cy-5 labeled BSA (5 ppm) and anti-BSA (3.8 ppm)
Buffers: 20 mM Na$_2$HPO$_4$, pH=7.4
Flow rate: 2 μL/min
Separation voltage: 1.3 kV

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Summaries

- A low-cost process was developed to fabricate microfluidic devices using soda-lime glass.

- A novel etching process was developed to remove the forming participates.

- A fast but reliable bonding process was developed to seal the channels without sophisticate heating and cooling procedures.

- The whole process can be done within 10 hours.

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