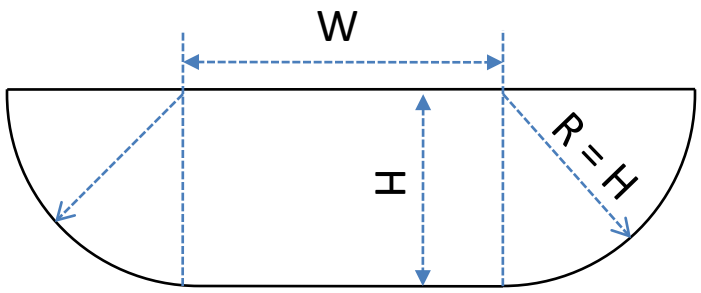
HF Etching Glass: Channel Cross Section & Mask Design



Glass Wafer Type	Property Highlights and Applications
BK7	High quality and high refractive index and low dispersion great for lenses, windows, and prisms in optical instruments
Borofloat 33	Great for Photonics to fabricate optical devices and components, such as optical filters, lenses, and waveguides, due to its high transparency and low thermal expansion
D263	Microelectronics and semiconductor manufacturing adn to fabricate optical fibers and laser components
Quartz	Excellent thermal properties and chemical resistance, used in photolithography
Indium Tin Oxide	Great for displays, solar cells, smart windows, optoelectronics and photonic devices
Soda Lime Glass	For depositing photoresist material surface and exposing it to light through a photomask and glass covers, microfluidics and microelectronic devices

Etched channel cross section consists of:

i.) 1 rectangle of width W and depth H;

ii.) 2 quarter circles of radius R = H.

Cross section area: $WH + \pi H^2/2$

Perimeter: $2(W+H) + \pi H$

Hydraulic diameter: $$\frac{4WH + 2\pi H^2}{2(W+H) + \pi H}$$

For mask design:

i.) W is the feature size on the mask;

ii.) H is the etched depth.

The minimum distance between the etched wells is limited by the desired depth.

Mathies:Glass Etching

From OpenWetWare

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Glass Etching

Safety

Any handling or use of hydrofluoric acid requires full safety gear. Wear a protective apron, chem-resistant gloves, and face shield. Be aware of the hazards related to HF and the proper response for any spills (especially on skin or clothing).

Types of glass

Borofloat (Pyrex) and D263

Etching Protocol

1. Before etching any glass wafer, make sure to protect the backside of the wafer with a layer of the blue disco tape. Some wafers have only bare glass on the back side, and if the wafer is coated the a-Si coating may still have pinhole defects.

2. Etching with 49% HF: This should be done in the non-MOS-clean etch tank in sink7, in the VLSI room. Make sure to fill the tank with enough acid to entirely cover your cassette and wafers, and gently agitate throughout the etch.

3. Etching with 1:1:2 HF:HCl:H2O or 5:1 buffered HF: The 5:1 buffered HF etch can be done in sink7 if desired, but in most cases it's easier to do these etches at one of the Old Lab sinks. You can set up an agitation tank using the a polypropylene tank, two polypropylene cassete-support blocks, and a teflon-coated stirbar. For the slower etches (which may run longer than 30 minutes or an hour), this is much simpler than agitating by hand. Note: If you use a thick photoresist (eg AZ4620), you may add 0.2% surfactant (3M Novec 4200 Electronic Surfactant) in the buffered HF.

Etch Rate

Borofloat

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* 49% HF = 6-7 um/min
* 5:1 buffered HF = 2.5-3 um/hr
* 1:1:2 HF:HCl:H20 = too slow to measure
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D263

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* 49% HF = 35-40 um/min
* 1:1:2 HF:HCl:H20 = 6-6.5 um/min
* 5:1 buffered HF = 10um/hr
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Contact

- **Eric Chu 16:15, 15 June 2009 (PDT)**:

or instead, discuss this protocol.