# Electronic Supplementary Information: Fabrication Process Diagram

## Microbioreactor arrays with integrated mixers and fluid injectors for high-throughput experimentation with pH and dissolved oxygen control

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Device fabrication steps:

a) Machine positive master molds with a computer numeric controlled milling machine.

b) Polish molds in methylene chloride vapor to eliminate microscopic tooling marks for optical clarity and easy mold release.

c) Cast negative device fabrication molds from PDMS.

d) Treat the surface with a fluorosilane compound to prevent adhesion to PDMS.

e) Cast the devices using the negative PDMS molds, which define internal device features, and polycarbonate molds, which define external device features. Embed oxygen sensors into base layer and cure for 1 hour at 65°C

f) Spin coat a fluorosilane treated silicon wafer with PDMS, monitoring the thickness with a low coherence interferometer. Cure for 30min

g) De-mold mixer and valve device layer and bond to partially cured membrane. Cure for 30min

h) cut the excess membrane and peel mixer and valve device layer from the silicon wafer.

i) De-mold the base layer. Deposit pH sensor in base layer, align with mixer and valve layer and seal.

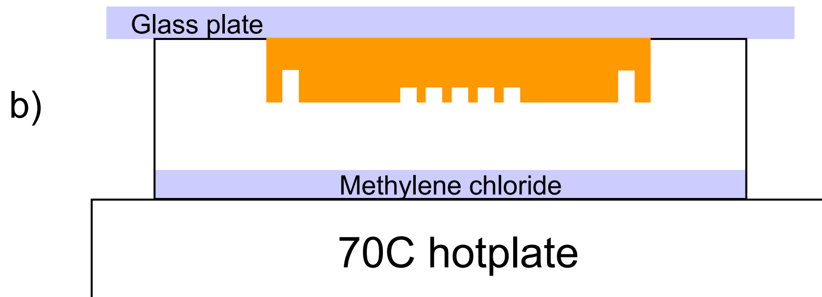
j) Cure for 8 hours at 50°C.

Machine master molds in polycarbonate (positive)

a)

Vapor polish – Methylene chloride, 3-5 seconds

b)



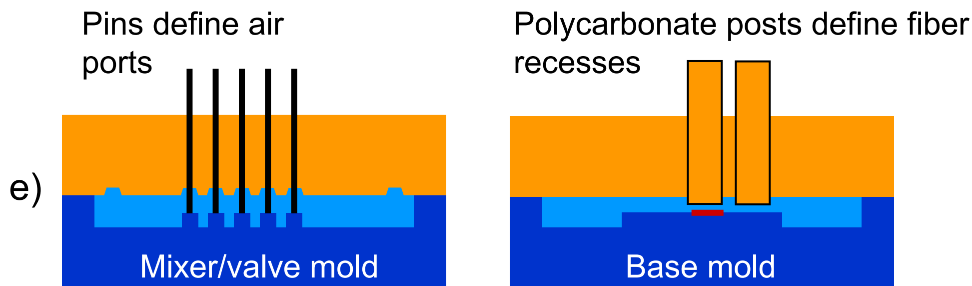

Cast PDMS molds (negative) 10:1 Sylgard 184, 4 hours 65ºC

c)

d) Surface treatment under vacuum 70ºC, >4hours (Tridecafluoro-1,1,2,2-Tetrahydrooctyl)-1-Trichlorosilane)

Cast devices, embed DO sensor, seal top with gasket plate and bottom plate

e)




Spin membrane, monitor thickness online with coherence interferometer, cure for ½ hour @ 65ºC

f)

Seal top to membrane, cure for ½ hour @ 65ºC

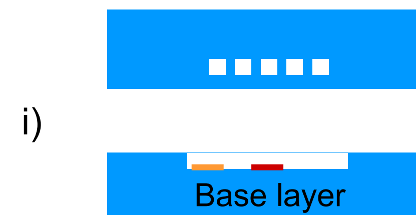
g)

Cutout membrane and top, seal to base

h)

Deposit pH sensor spots, Align and bond

i)




Cure for 8+ hours @ 50ºC

j)