

## Rapid manufacturing for microfluidics

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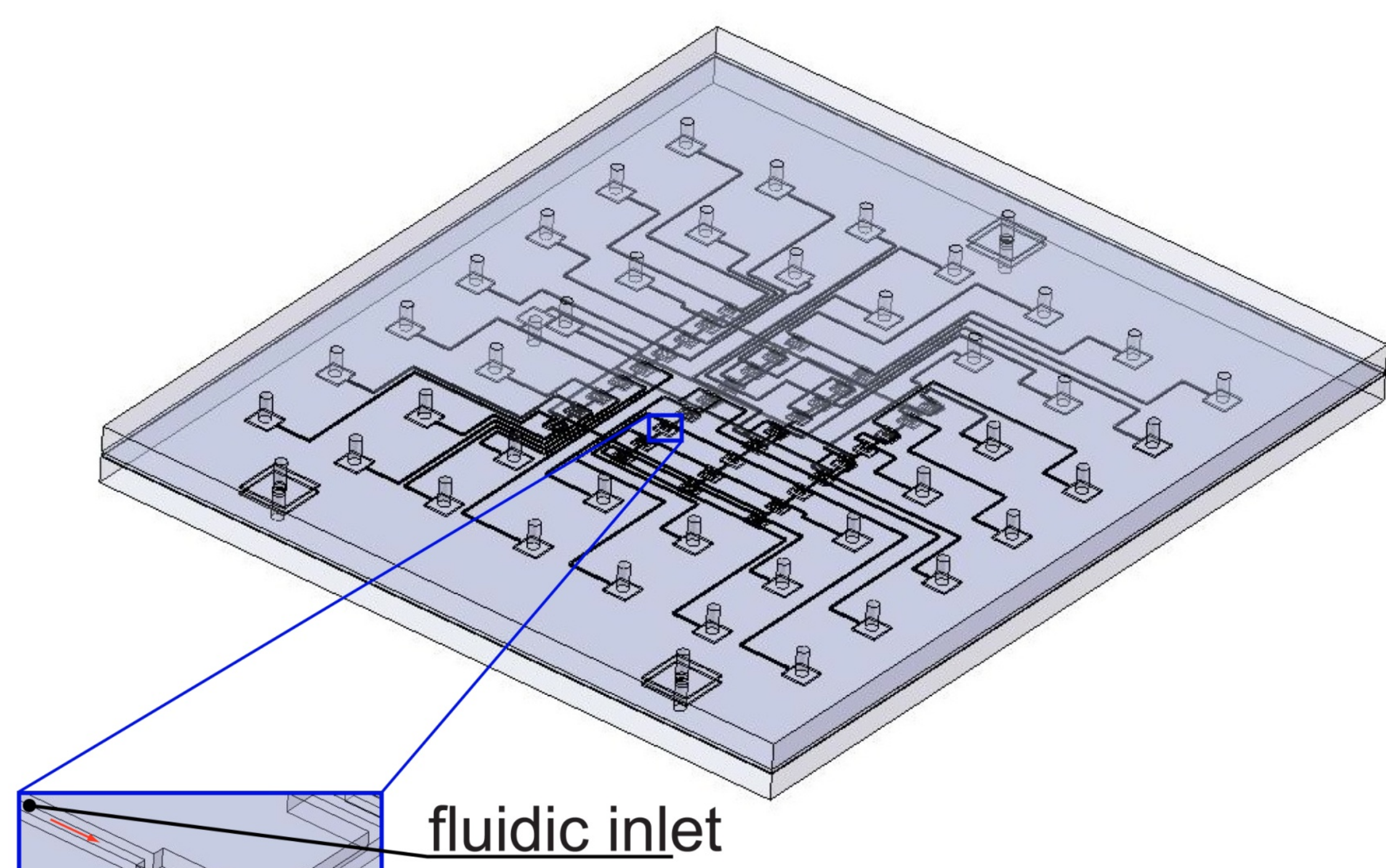
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### INTRODUCTION

Microfluidics refers to the manipulation of very small volumes of fluid. Microfluidics is at the forefront of developing solutions for drug discovery, diagnostics (from glucose tests to malaria and TB testing) and environmental diagnostics (*E-coli* monitoring of drinking water). In order to quickly implement new designs, a rapid manufacturing capability is required. For this purpose, the CSIR has funded the establishment of a clean room and manufacturing facility for the production of microfluidic devices. The process flow for this manufacture is described in the following sections.

### DESIGN

The full device is designed in a standard CAD package. Once finalised, this design is split into a number of layers which can be individually manufactured.



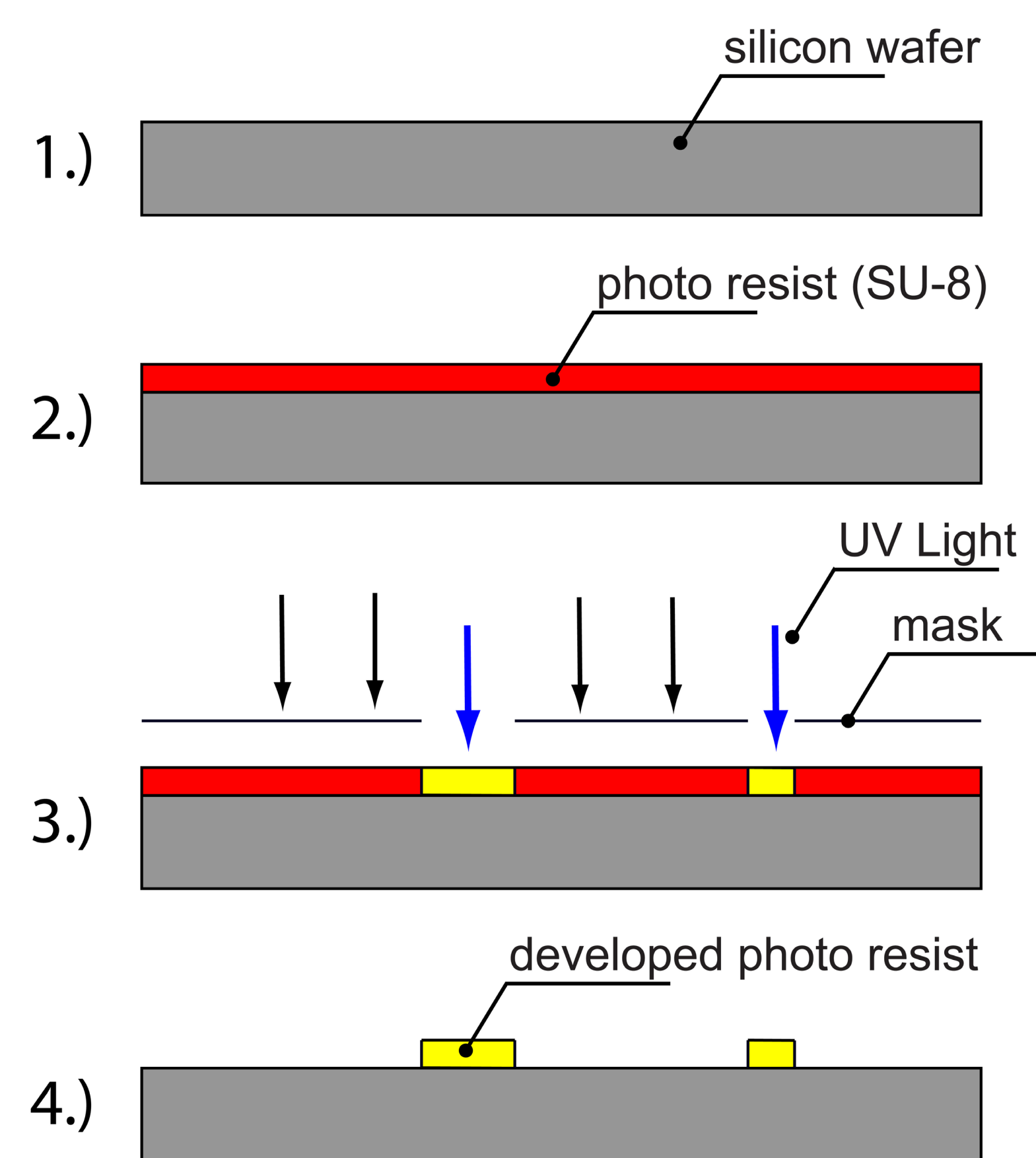
### CLEAN ROOM

A silicon wafer is utilised as a substrate and structures are built onto this substrate in a clean room. In addition to the clean environment, the room is also protected from UV light, allowing for UV cross-linking processes to be utilised for building the structures.



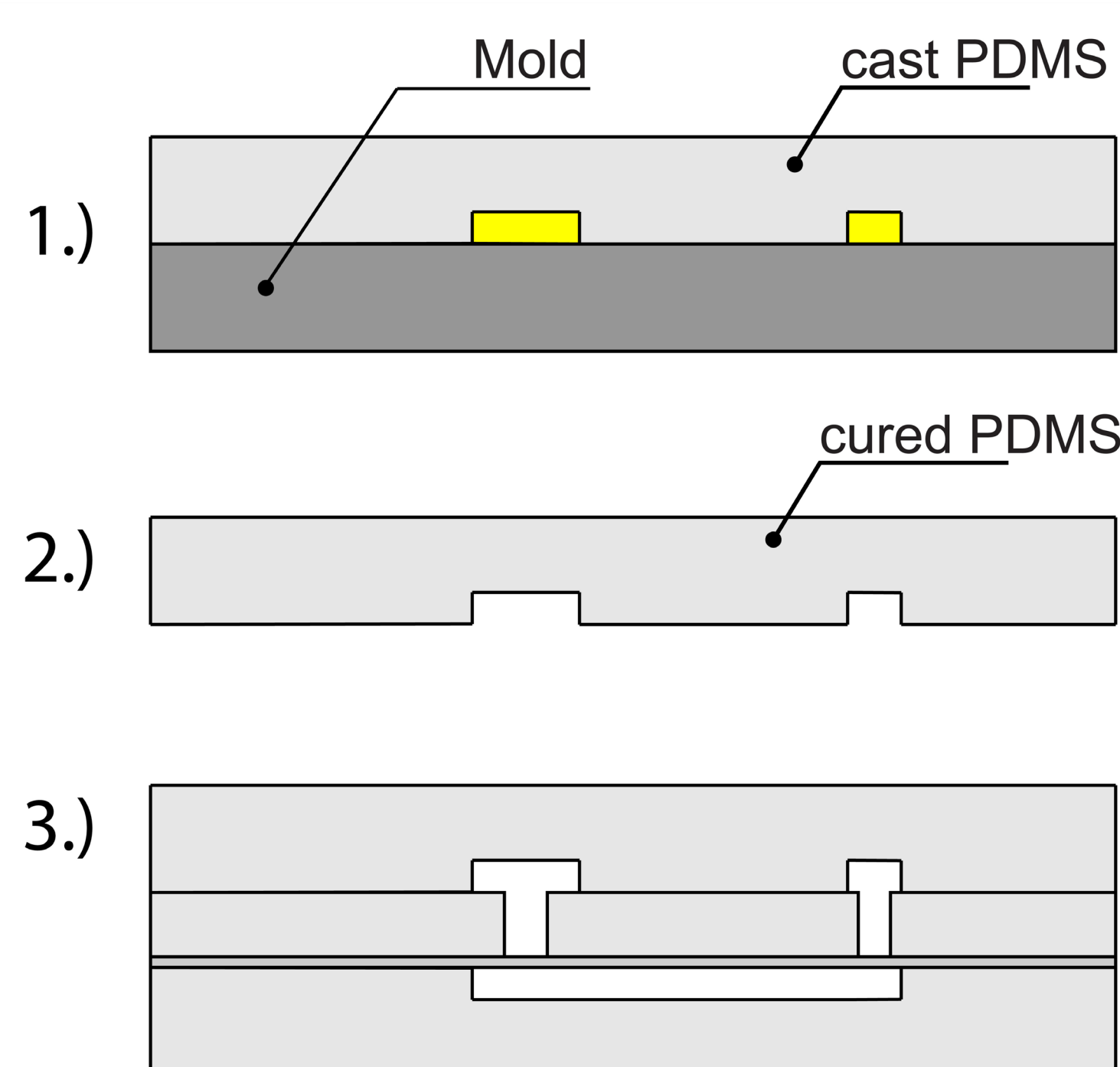
### MANUFACTURING

#### CLEAN ROOM PROCESS



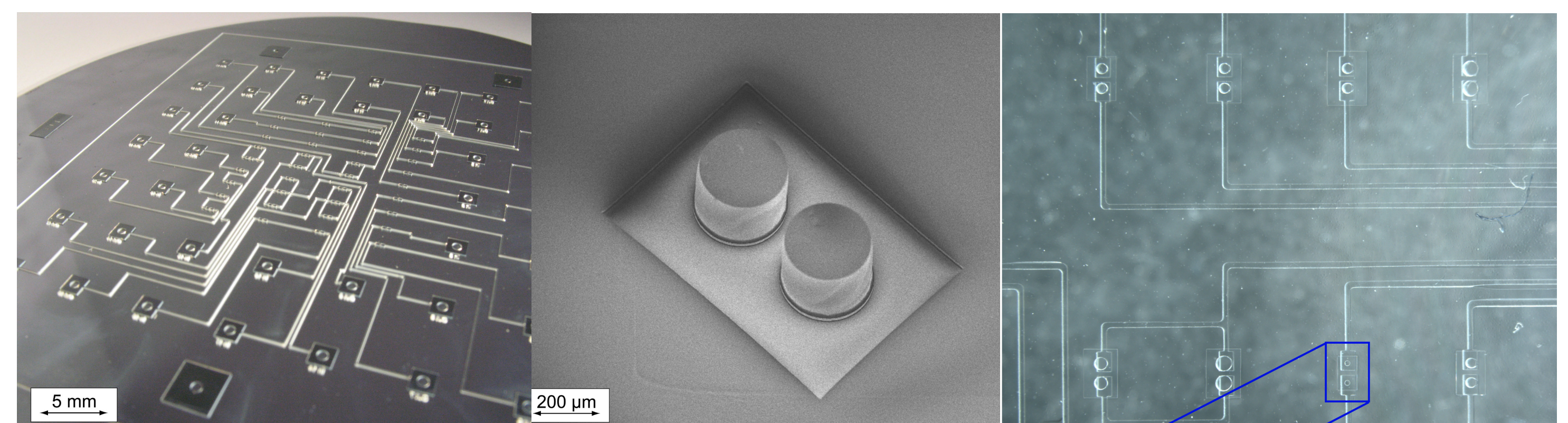
1. Cleaning and preparation of the silicon wafer.
2. Spin coating of SU-8 negative photoresist and soft baking on a hot plate.
3. Exposure with mask aligner through a transparency mask. Exposed areas will remain as features. Post-exposure baking.
4. Develop the SU-8 to expose features.

#### DEVICE MANUFACTURE

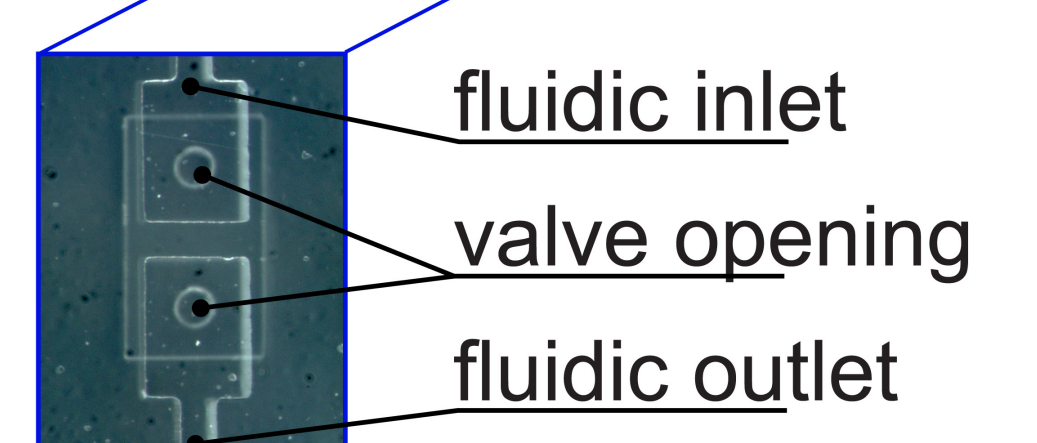


1. PDMS casting on mould.
2. Peel off cast PDMS to create a single layer.
3. Bond single layers to form a functional device.

### FINISHED DEVICES



Silicon mould showing the feature sizes achievable



Finished devices

### REFERENCES

- [1] Kevin J. Land, Mesuli B. Mbanjwa, Klariska Govindasamy, and Jan G. Korvink, "Low cost fabrication and assembly process for re-usable 3D polydimethylsiloxane (PDMS) microfluidic networks," *Biomicrofluidics* 5, 036502 (2011), doi:10.1063/1.3641859