The fabrication of the microchannel

The rectangular micro-channels are made by soft lithography. The three upper faces are made of PDMS and the lower face is a glass coverslip as shown in figure. This configuration allows easy observations by microscopy. The height of the channel is h=50µm, its width is w=200µm, and its length is L=2cm (figure).

Our masters are made with SU-8 negative photoresist. SU-8 is first spin-coated on a circular silicon wafer. It is heated at 80°C to get a 50µm high solid layer of resin. Then a certain region of resin is exposed to UV light thanks to a plastic mask which is transparent in the geometry of the channel and opaque elsewhere. The design of the plastic mask has been drawn with a specialized software. The plastic mask has been made by a private company. Then the wafer is put in a solution of SU-8 developer which dilutes the SU-8 not exposed to UV light.

The PDMS is a mix of solutions of cross-linking agent and monomer with a proportion 1:10. The liquid PDMS is poured on the master. The chip is let in a vacuum chamber during 20 minutes to make the bubbles go up and reach the surface of PDMS. After elimination of the bubbles at the surface, the PDMS is heated at 80°C during two hours to make it solid. The solid PDMS is removed from the master and the designed channels are cut. One piece of PDMS is then pasted to a glass coverslip by plasma process. The coverslip is 50mm long, 24mm large and 0.15 thick. Both the piece of PDMS and the glass are exposed to plasma during 40 seconds in a pressure of 300mTorr. After few minutes at ambient temperature, the channel can be filled by a liquid.