PMMA PROCESS

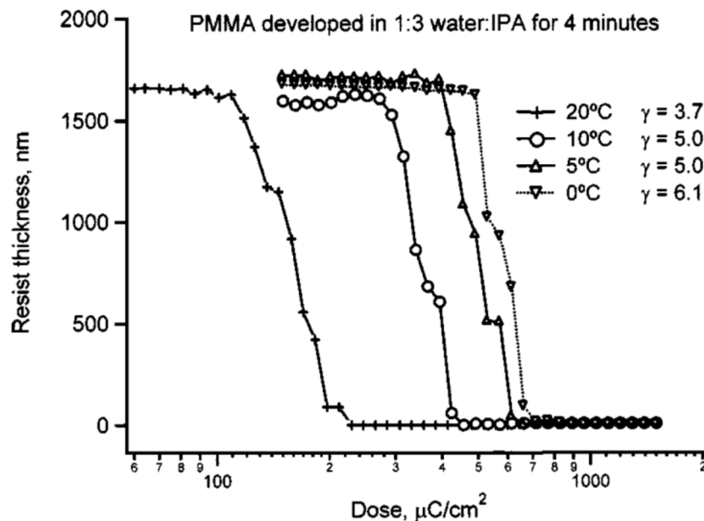
1. Spin 950k MW PMMA, 3% or 4% solution in anisole.
   Spin for about 1 minute or until the film looks uniform.
   Bake at 180°C on a hotplate, for about 2 minutes. The bake time and temperature are not critical.

   Approximate thickness of 3% PMMA spun at 3 krpm: 150 nm
   Approximate thickness of 4% PMMA spun at 3 krpm: 200 nm
   Confirm the thickness by scratching the film with tweezers and using a stylus profilometer (the Dektak or Alphastep)

2. Expose at 100 kV
   Typical large-area dose is 1000 $\mu C/cm^2$
   Be sure to include the standard dose test on every substrate.

3. Develop in IPA:water 3:1 at 5°C for 1 minute. You can use other temperatures, but it is important to be consistent. The development temperature is important. (The older developer, MIBK:IPA 1:3 also works, but IPA:water is better, for several reasons.)

   Blow dry with nitrogen, or spin dry. Do not rinse in anything else. Do not rinse in alcohol.



4. For more information, see J. Vac. Sci. Technol. B Vol. 20 No. 6, Nov/Dec 2002
   If you need high aspect-ratio slots in the resist, use ultrasonic development.

5. Liftoff: evaporate metal, eg 5 nm Cr then 20 nm Au, then soak off the PMMA in NMP at 150°C. Do not heat the NMP above 200°C. Alternatively, use acetone. Do NOT heat acetone, since it is highly flammable. If single-layer PMMA leads to “flags” on the edges of metal lines, then you can try using a bilayer resist (see below) that creates a much larger undercut in the resist.

6. Etching: PMMA can be used as an etch mask if the plasma power is low. In a typical RIE system, keep the power below 100W. Here is a typical recipe for etching silicon oxide in an Oxford-80 etcher. This etches silicon oxide or silicon nitride at about 10 nm/min, while etching PMMA at about the same rate:

CHF_3	40 sccm
O_2	2 sccm
pressure:	30 mTorr
RF power:	100 W

7. Stripping the resist: use warm NMP or an oxygen plasma. Typical parameters for oxygen are: 30 sccm oxygen, 30 mTorr, 200W, 2 minutes.