TP A : thermal micro-actuators

Questions for the A2 session

Q1. We have a wafer with SiO2 and Cr, why aren't we using the vapor HMDS surface treatment?

Q2. We aim to obtain a 1.5µm thick AZ1512 layer, what parameters need to be used for the spin coating? Look for the answer on the CMi website.

Q3. Determine the duration of exposure from the data sheet of the photoresist given by the supplier and from the light power at the level of the substrate (information available next to the machine, approximately 20mW/cm^2). The photoresist is AZ1512 and is 1.5µm thick.

Q4. Do you expose the parts where you want Cr to remain after the etching step or the parts where you want to etch the Cr?

Q5. How do you place the mask: the Cr side or the glass side towards the PR? Why? How do you recognize which side goes towards the wafer?

Q6. How long should you put the wafer in the developer? Why is this an important parameter?

Q7. Why do we pattern the photoresist to cover the Cr at the places where we want the electrical tracks to be?

Q8. Take a few pictures (including one at high magnification to measure the width of PR/Cr track). Does the width of the PR features match the one of the Cr features in your design file?

Q9. Given that we have a 500nm thick Cr layer and Cr features separated by at least 5µm and at least 5µm wide, how long should you put the wafer in the Chrome-etch solution? Why is this an important parameter? What happens if you leave it for too long? Use a schematic showing how the etching progresses to justify your answer.

Q10. How long did you leave the wafer in the Chrome-etch solution?

Q11. How did you detect the end of the etching procedure? Describe what you observed.

Q12. Acquire pictures of your overall design and of zones of interest (defects,…).

Q13. Acquire high magnification pictures of the same track as you observed in Q8 to compare the width of the Cr track and the width of the PR. Does the width of these features match the width of the features in the design file? Why?

Q14. What's the advantage of the 4 points measurement? Why? Explain the principles.

Q15. Compare the resistance you measured to the resistance you computed in the preparation, do they match? Explain the differences. (Hint: have a look at the parameters for thin Cr films deposited by evaporation on the EVA 760 : Parameters EVA 760. These parameters aren't reported for the EVA 600 used for this practical, but you can assume they're the same.)

TP A : thermal micro-actuators

Questions for the A3 session

Q16. We have a wafer with SiO2 and Cr, why are we now using the vapor HMDS surface treatment?

Q17. We aim to obtain a 1.5µm thick AZ1512 layer, what parameters need to be used for the spin coating?

Q18. Determine the duration of exposure from the data sheet of the photoresist given by the supplier and from the light power at the level of the substrate (information available next to the machine, approximately 20mW/cm^2). The photoresist is AZ1512 and is 1.5µm thick.

Q19. Do you expose the parts where you SiO_2 to remain after the etching step or the parts where you want to etch the SiO_2?

Q20. How do you place the mask: the Cr side or the glass side towards the PR? Why? How do you recognize which side goes towards the wafer?

Q21. How long should you put the wafer in the developer? Why is this an important parameter?

Q22. Why do we pattern the photoresist to cover the SiO2 at the places where we want the beams to be?

Q23. Take a few pictures (including one at high magnification to measure the width of PR/SiO2 beam). Does the size of the PR features match the size of the features in the design file?

Q24. Given that you have a 1.5µm thick SiO2 layer with features spaced by minimum 5µm and with critical dimensions of minimum 5µm, how long should you put the wafer in the BHF solution? Why is this an important parameter? What happens is you leave it for too long? (Hint: look at the link Arias ACID Z14). Use a schematic showing how the etching progresses to justify your answer.

Q25. How long have you left the wafer in the BOE solution?

Q26. How did you detect the end of the etching step? Describe what you observed and explain it..

Q27. Acquire pictures of your overall design and of zones of interest (defects,…).

Q28. Acquire high magnification pictures of the same beam as you observed in Q23 to compare the width of the SiO2 beam and the width of the PR. Does the size of the SiO2 features match the size of the features in the design file? If there's a difference, explain why.

Q29. Using the Vernier scale, evaluate the quality of the alignment .

Q30. Acquire profile curves and extract the Cr and SiO2 thickness.