

ENSC 495/851 Tutorial 1 – Mar. 22- 2016

A 0.60 μm film of silicon dioxide is to be etched with a buffered oxide etchant of etch rate 85 nm min^{-1} . Process data shows that the thickness may vary up to 13.8% and the etch rate may vary up to 21.0%. (a) Specify a time for the etch process. (b) How much undercut will occur at the top of the film?

(a) with a total process variation of 134.8% (100% + 13.8% + 21.0%) , a safe etch time would be: (2 marks)

$$(0.60 \mu\text{m})(134.8\%) / (85 \text{ nm min}^{-1}) = 9.60 \text{ mins}$$

worse case:

$$(0.60 \mu\text{m})(100\% + 13.8\%) / [85 \text{ nm min}^{-1} \times (100\% - 21.0\%)] = 10.26 \text{ mins}$$

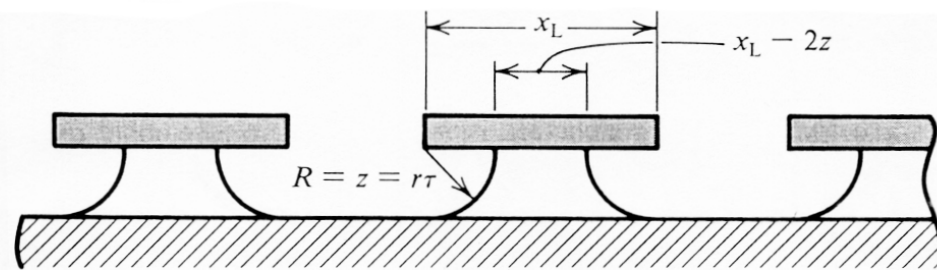
(b) Undercut will be:

Lateral etch:

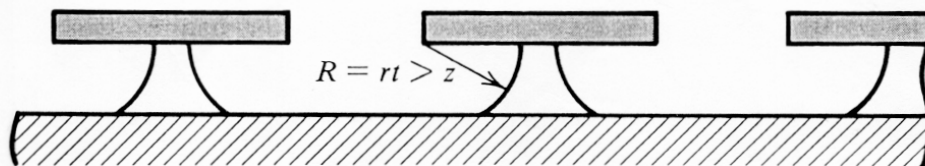
$$(85 \text{ nm min}^{-1})(10.26 \text{ mins}) = 0.87 \mu\text{m typical per edge (no overetch) (1.5 marks)}$$

Worse case:

$$(85 \text{ nm min}^{-1})(100\% + 13.8\%)(10.26 \text{ mins}) = 1.05 \mu\text{m (0.5 marks)}$$



(c)



(d)

(c) Ideally etched film, etch time $\tau = z/r$. (d) Film after overetch, etch time $t > \tau$.