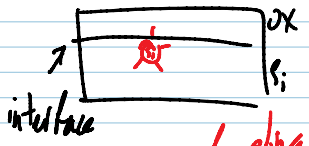
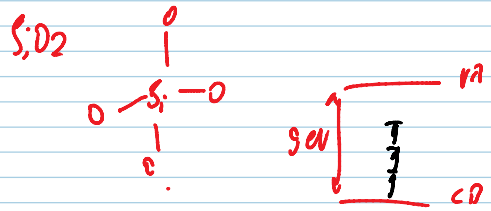
Dis 3, Mon Sep 17

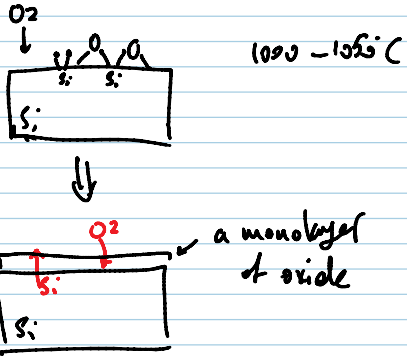
Monday, September 17, 2012
4:09 PM

Silicon Oxidation:



dangling bond



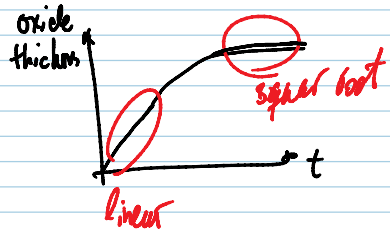


1000 – 1050 °C

Grove - Deal Model

$$\frac{x^2}{B} + \frac{x}{B/A} = t + \tau$$

depending on Temp., reactant gas, orientation of silicon

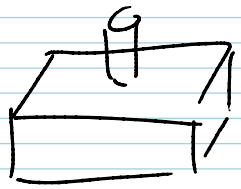


Dry oxidation ~ 0.7 – 0.8 μm

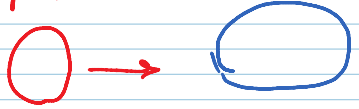
wet " ~ 2 – 2.5 μm

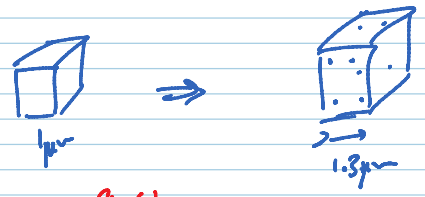
It is just a 1D model

2D-3D

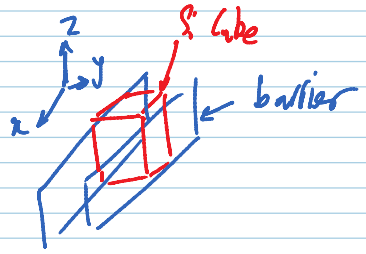


Top view





$(1.3)^3 = 2.2$ for the volume



x & z direction → grow $\sqrt{2.2}$ ✗

y-direction → confined

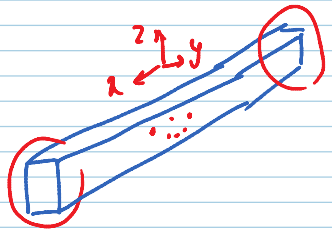
↑ 2D growth

Confine in 2 direction

2-y → confined

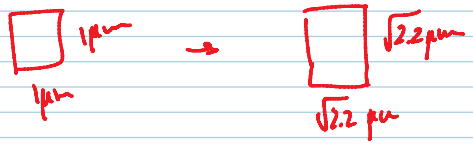
2 → 2.2 ✗

2D → one of directions is much larger than the two other



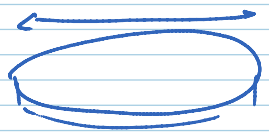
x-direction no change in length

y, z → $\sqrt{2.2}$ ✗

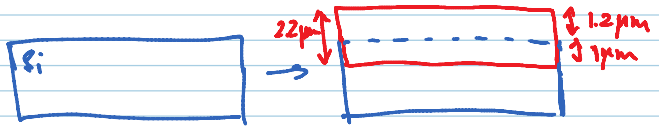


using 1D model → $t = \frac{x^2}{B} + \frac{x}{B/A} = \frac{(\sqrt{2.2}\mu)^2}{B} + \frac{\sqrt{2.2}\mu}{B/A}$

1D like wafer oxidation



cross section



$\frac{1}{2.2} = 45.45\% \simeq 46\%$

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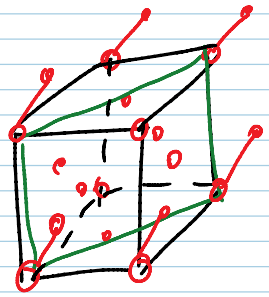
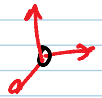
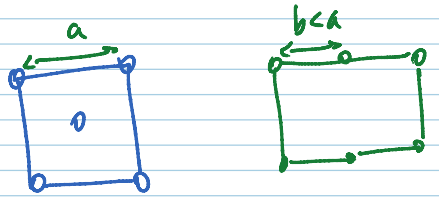
$\frac{12}{2.2} = 54.54\% \simeq 54\%$

Crystallography







1- number of atoms per unit area

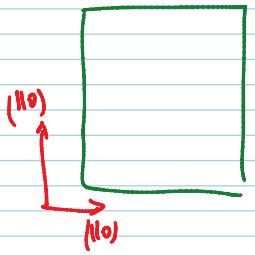
2 - " " bonds.

KOH

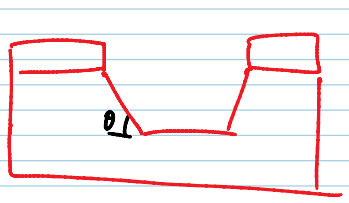
Top view

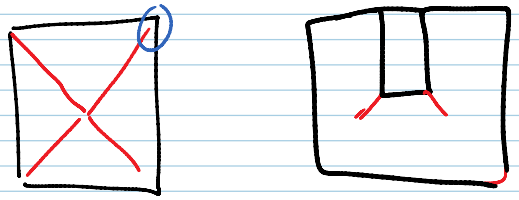
(100) wafer

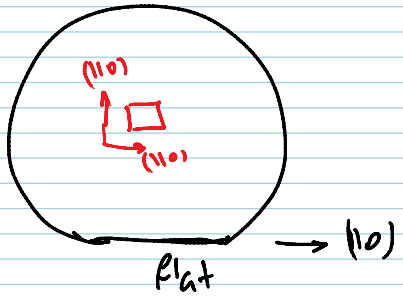
⊙ - (100) direction

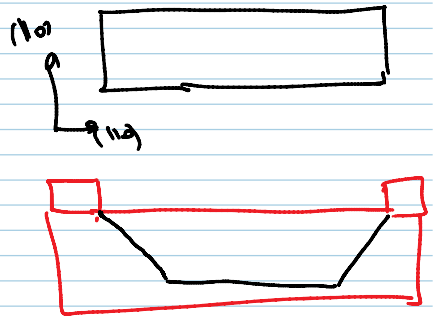


(111) & (110) → $\theta = 54.7°$


(0 2 1)




(110)
(110)
flat
(110)


(110)
(112)