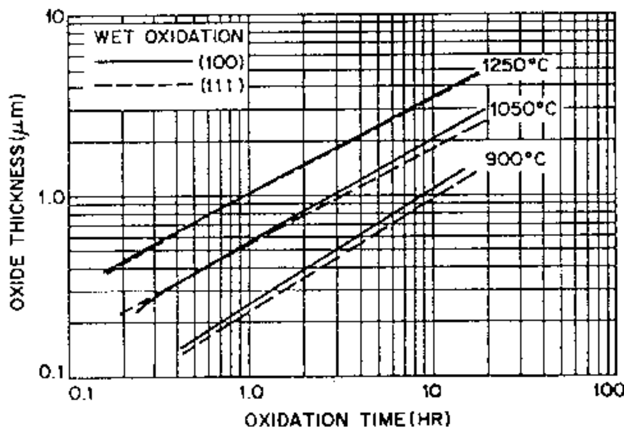
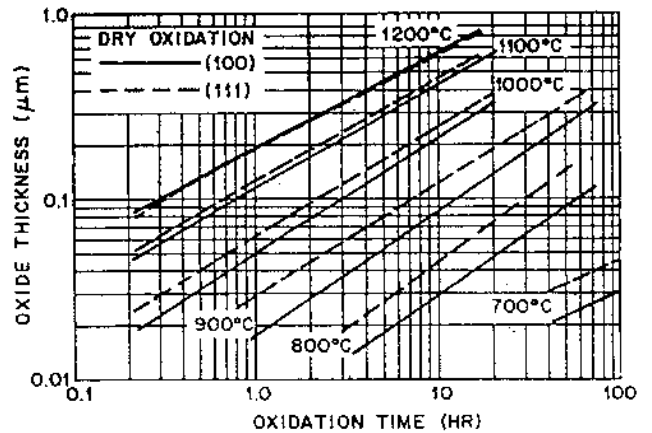
PME 4352 Homework1 **Due 10/15**

1. How long will it take to thermally grow a 1.0 μm thick SiO_2 film on a (100) substrate at 1200°C, by (a) wet oxidation, and (b) 0.2 μm dry and then 0.8 μm wet oxidation

   How about growing a 2.0 μm thick wet SiO_2 at 1100°C





2. Can you estimate the residual stress of the SiO_2 film for problem 1, (a) after the substrate is brought outside the furnace (T = 30°C)

   Thermal expansion coefficients : **Si** : 2.3 x 10^{-6}/ °C , and **SiO_2** : 5 x 10^{-7}/ °C
   Young's modulus : **SiO_2** : 70 GPa

3. If the SiO_2 film in Prob. 2 is only grown on one side of the substrate, then the substrate will be deformed like I or II after brought outside the furnace and cooled down to room temperature, why?