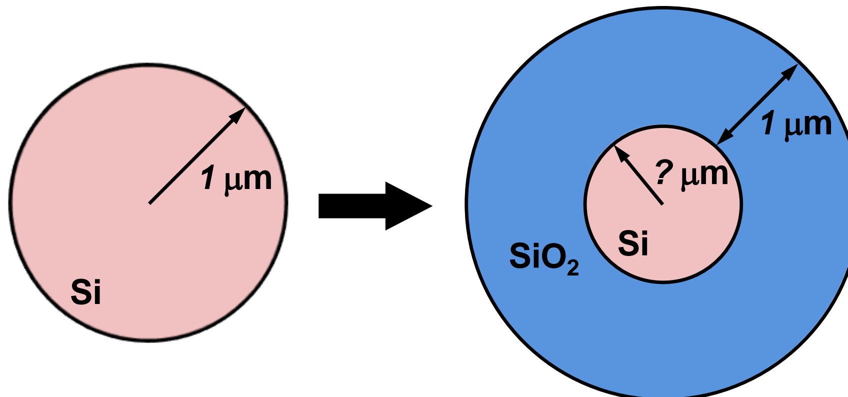
PROBLEM SET #5

Issued: Thursday, Feb. 25, 2010

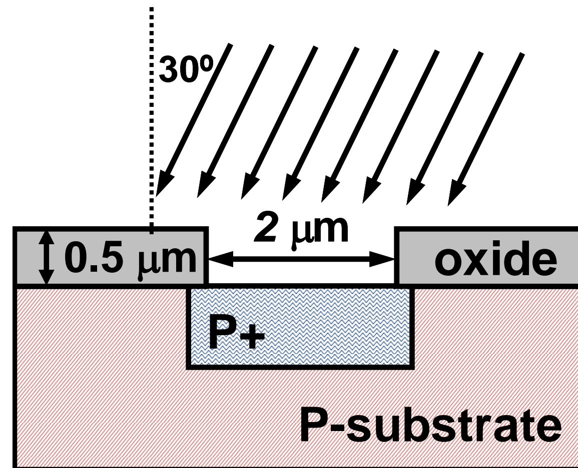
Due: Thursday, Mar. 4, 2010, 7:00 p.m. in the EE 143 homework box in 240 Cory

1. You would like to oxidize a 1-μm radius cylindrical polysilicon rod as shown below via thermal oxidation at 1000°C to form a 1-μm-thick oxide sheath.



Pure silicon contains 5×10^{22} Si atoms per cm^3 and silicon oxide contains 2.3×10^{22} SiO_2 molecules per cm^3. After the 1-μm-thick oxide sheath is grown, what is the radius of the silicon rod remaining in the middle? Assume that cylindrical symmetry is maintained during the oxidation.

2. Suppose you plan to evaporate aluminum over a substrate with a layer of patterned oxide to form an ohmic contact as illustrated below. Assume the evaporation source is very far from the wafer such that the evaporation flux can be considered as uniform and parallel and also the contact opening has straight vertical sidewalls. The aluminum film deposition rate is 100nm/min and the evaporation flux has an angle of 30° with respect to the normal of the wafer surface. Draw the cross-sectional profile of the evaporated film over the oxide and silicon and label the film thickness at all relevant locations after 1 minute of evaporation.



3. Problem 6.8, 6.9, 6.11 in the textbook (Jaeger).