PME 4352 Homework 4

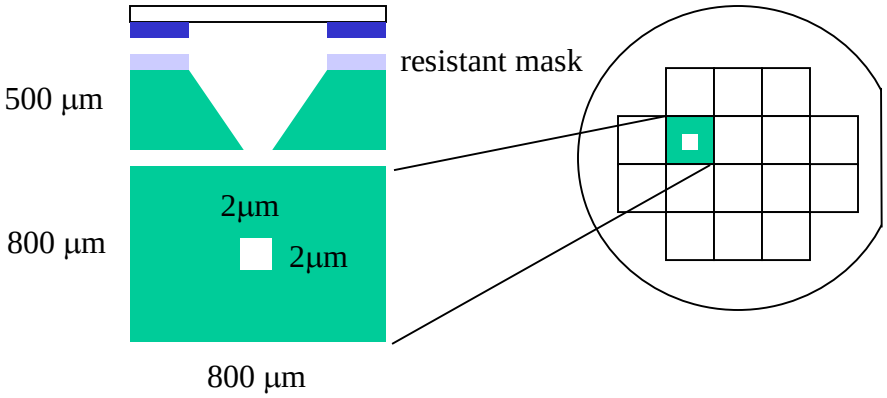
Due 11/12/2021

1. In order to open a 2μm by 2μm hole on a 500 μm thick (100) wafer anisotropically,

(a) what's the dimension of the pattern on the resistant mask?
(b) if the hole is on a 800 μm by 800 μm chip, how much volume (in percentage) is removed from this chip?

When using SiO_2 as the resistant mask, how thick will the SiO_2 film be to protect the silicon wafer, if the etchant is

(c) KOH (etch rate:1.5μm/min for (100) Si, 1.5 nm/min for SiO_2)
(d) EDP (etch rate:0.75μm/min for (100) Si, 0.2 nm/min for SiO_2)



2. As shown in the figure below, the sacrificial layer is removed by undercutting through the access hole. The top structural layer is uniform with 2μm thick. The length of the sacrificial layer is 100μm. During the release, the structural layer is also exposed to the sacrificial etch. Assume that the sacrificial layer etch proceeds at a uniform rate R=1 μm/min, and the etch has a selectivity of 800:1.

(a) Calculate the time required to remove the sacrificial layer.
(b) Calculate the profile of the walls inside the channel.
(c) What is the final shape of the channel.
(d) What is the minimum and maximum thickness.

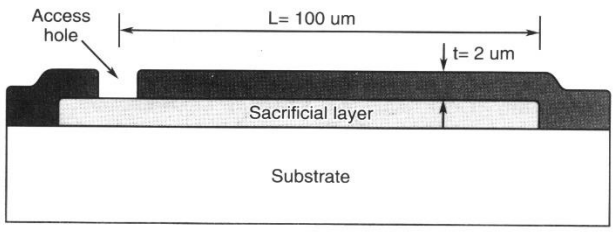


Fig. P2

3. In problem 2,

(a) Calculate the minimum selectivity required such that the structural layer is not removed.
(b) Calculate the selectivity such that the wall thickness does not change by more that 20%.