Homework #8 Solutions

Problem 30

Hydrogen peroxide is used to oxidatively breakdown organic contaminations on the Si wafer.

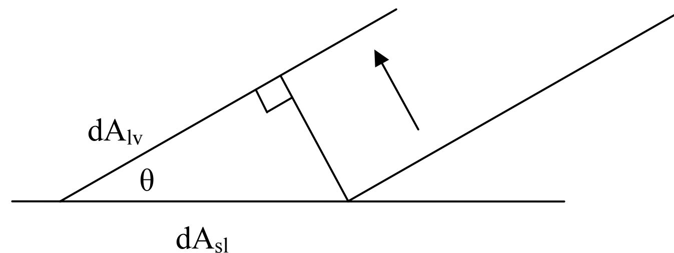
Problem 31

Megasonic cleaning, used in conjunction with the RCA cleaning method, can physically remove particles from sample surfaces which would otherwise remain "stuck" due to the adhesive forces of sub-micron particles. The article points out that the particle removal efficiency increases at higher acoustic power. Cavitation, the collapse of vapor bubbles, may lead to surface damage. At megasonic frequencies, cavitation is eliminated.

Problem 32

To solve this problem analytically, you have to write down equations for the area of the surface of the drop and the area of its base and differentiate with respect to the radius of the drop, subject to the constant volume constraint. However, a simple intuitive solution suffices.

Intuitive solution. Assuming the change in the areas is very small. Then,



Assume the form of the drop changed so that the point at the liquid-vapor substrate interface was displaced by $\delta A_{sl} \cos\theta = \delta A_{lv}$.

Problem 33

In this new cleaning process, ozonized DI water and diluted HF are alternatingly applied to a spinning wafer. Ozonized water removes metal particles and organic contaminates on the wafer surface by oxidizing and dissolving them. Metal particles in the native SiO_2 layer and residue organic molecules are then removed when HF is applied. Since fresh chemicals are constantly supplied, re-absorption of contaminates is less likely to happen. Comparing with traditional RCA type of process, this cleaning process uses fewer chemicals and is more environmental friendly, but it may consume more time.