Dec 12, 2017

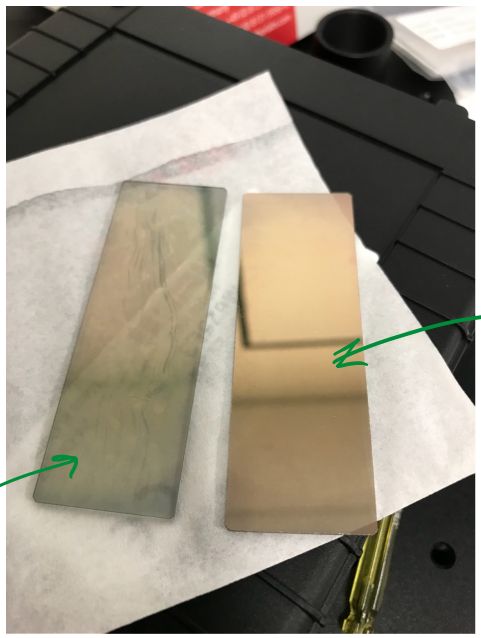
Tuesday, December 12, 2017 2:06 PM

Tuesday lab

Goal for the day: Observe surface plasmon resonance or determine what equipment I'm missing

I made two gold plated slides using the gold sputter coater

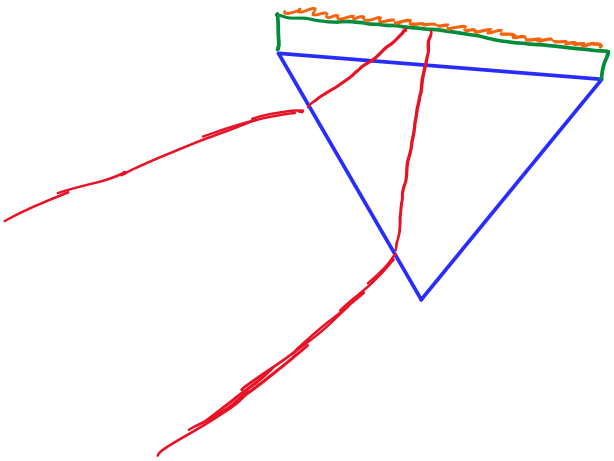
One slide was in the coater for 1 min @ 40mA and the second was in for 2min @ 40mA



Note: Cut slides in half or 1/3 before coating next time

Cut slides & coverslips from Sosiak

I put a tiny drop of emersion oil on the prism and placed the slide on top of that, gold side up. My understanding of the geometry is as follows



I should be able to see a spot on top with a dark band through it. If I rotate the polarizer the band should go away.

Oh, looking at my notes from the Immersion workshop it looks like I should see a bright plasmon band while looking from the top due to scattering but my notes also specify "horizontal dark band but at constant angle relative to surface". Not sure what that means

My notes also specify that the laser works better for air but the LED works better for water.

Notes say "line should be stationary as you change angle of light source.

Papers:

"Surface plasmons in Silver films - a novel undergraduate experiment"

polarize in plane of incidence

Want p-polarized light at a few angles past TIR for glass-air interface → minima in

reflected light.

plasmon wavevector $K_x = \frac{\omega}{c}\left(\frac{\varepsilon}{\varepsilon+1}\right)^{1/2}$

when $\varepsilon < -1$ — typically for metals in visible part of spectrum

$\Rightarrow K_x >$ wavevector of same frequency in air

Includes derivation of dispersion eqn

If film is too thick or too thin you won't see change in reflectivity

In the paper they mention a 56 nm silver film has 1% transmission @ 632.8nm
So I'm guessing my films may be too thin.

Note that if the film is too thick the evanescent wave will not reach the air/metal interface to create surface plasmons

→ Can you get surface plasmon at a solid-solid interface or does one of the media need to be a gas or liquid?