# J.A. Woolam, V-VASE Spectroscopic Ellipsometry Measurement and Analysis

Ellipsometer Tips

- The hardware should be initialized, but if it is not, restart the VASE program and click "initialize" on the top bar.
- Turn the power on and ignition on and let the lamp power up for about 10 minutes before taking measurements.
- When calibrating, you oftentimes only need to do fine calibration. Use the silicon wafer for calibration and be sure to handle the wafer with gloves.
- Turn vacuum on and switch from vent to vacuum to attach your sample to the platform.
- You can use a business card (there's should be one near the system) to make sure the beam is completely on the sample.
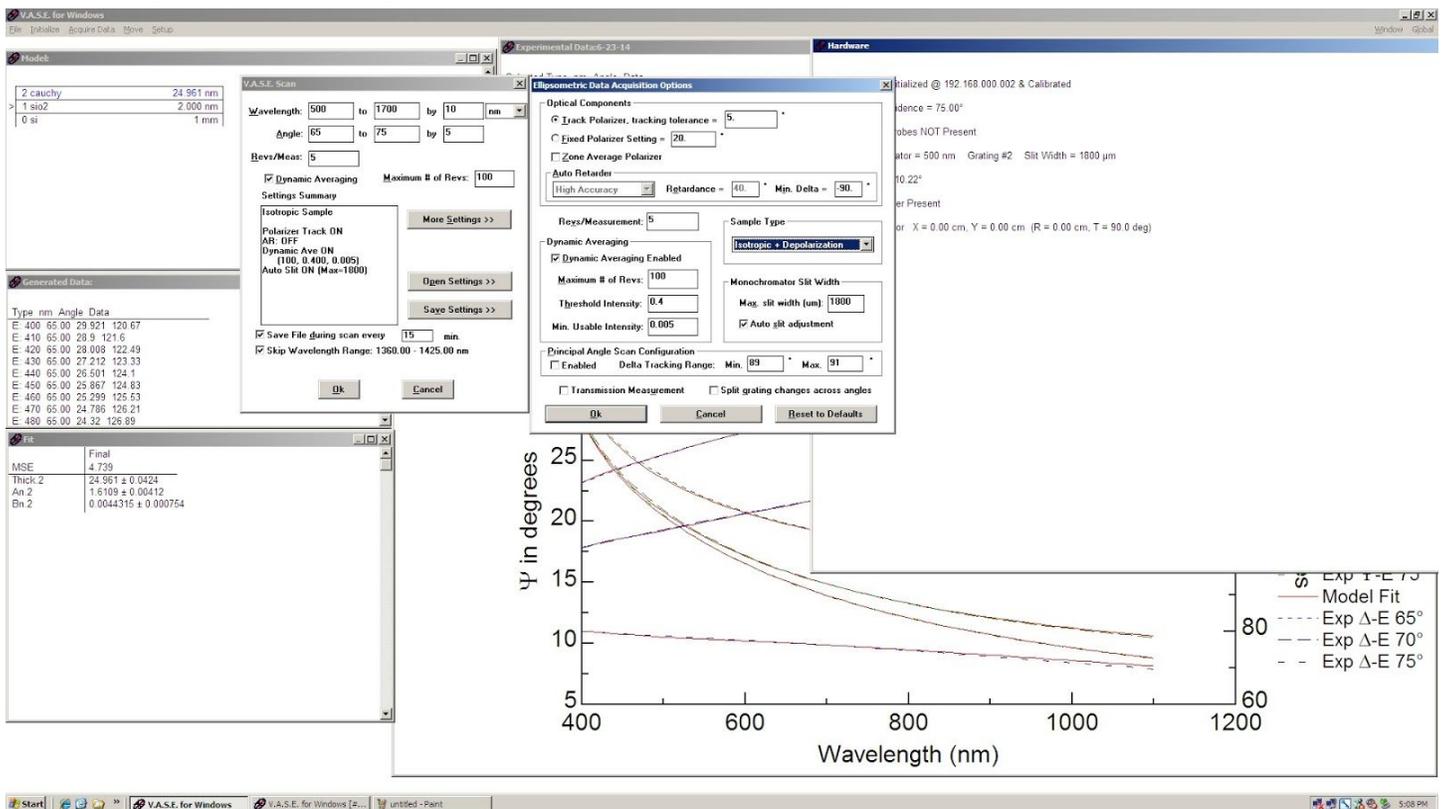
use Iso + Depole for sample you expect to be rough/porus (nonhomogenious)

Modeling

Check Data
1. Confidence values should generally be nice and low (What does this mean??) Pic??
2. Based on the number of fringes you can estimate what your thickness could be
    a. 1 fringe - about 100 nm   2 fringes - about xxxnm

Setup initial model
1. Find and insert a layer for your substrate - this may not exist but can be created (See creating reff data)
2. Add a Cauchy Layer
    a. Set parameters to initial values (Thickness = based on guess, A=2, B= 0.1, C=0, K=0, Exp=1.5)
    b. Turn on fitting of thickness, A
3. Try Fit
4. If fit is not good try in order:
    a. Try adding B
    b. Try adding B and C
    c. Remove C Try B and K
    d. Try adding B, K, Exp
    e. Try adding all

Note: to take out K you must set it to 0 even if you are no longer fitting it

General Fitting Procedure
1. Change Model
2. Try Normal Fit
3. If MSE Below 20 Check Optical constants
    (Note if B or C are (-) it is a sign that model is likely not real - check carefully)
    a. Right click on graph and select current layer optical constants
    b. Click down arrow to see n
    c. It should be monotonically decreasing if not it is not a real fit
4. Right click fit window - click reset to put all values back to previous

Note: Using Edit parameters can help you to understand how changes work. sometime you can also shift far to find global minimum instead of local one that your fit was stuck in

Advanced Models
Try these one at a time in following order:
1. Non Idealities
    a. At top select options
    b. Thickness is the only one that seems to help
2. Roughness Layer
3. Simple Graded (n variation)
    a. Set wavelength to something reasonable - e.g not at edge of your scan - maybe 700nm
    b. Can tell you about sample - i.e. if edges of sample are crap...
4. EMA (roughness through whole sample - voids...)
    a. vary the void percent

b. use Baugerman
5. Remove Lines that seem to be hard to fit
   a. e.g. 65° - using Range select
6. Combo of dens Cauchy and nondense EMA Cauchy

Creating Reference data
1. Do all treatments to substrate that it would see during processing
2. Run Spectroscopic scan (Isotropic) of a larger range than you typically run at 10 nm steps
3. Need to talk to brady about next steps…