

Thin Film Analysis

Determination of film thickness

1. Click on TFCompanion icon to start application – Username: **EP3**; Password: **EP3**
2. To load previously saved data file go to **File** menu and select **Import measured data**
3. Navigate to the correct directory and select the file you want to load
4. Go to **Filmstack** menu then select **Edit Filmstack**
5. In the Filmstack editor window add or remove filmstacks or materials to build the model you plan to use then click **OK**. The model starts with the substrate on the bottom and goes up from there.
6. In the main window (**See Figure 1**), in the Filmstack tab of the Filmstack window, click on a material tab to view and adjust parameters or add materials.
 - To test a range of thicknesses, select “**Custom**” from the Order Search drop-down menu, and input the desired numbers (# of points: 10-20 recommended) (**See Fig 2**)
 - Note: the medium in which the measurement was taken can also be changed by clicking on the “Ambient” button in the upper left corner of the Filmstack tab.
7. Go to the Parameters tab in the Filmstack window. Select the values you wish to solve for by clicking the check marks.
 - To solve for the refractive index and/or extinction coefficient, you will need to enter the wavelength you want the program to solve for. The wavelength needs to be one that is included in the imported data.
8. Click **Recalculate** to apply the selected parameters
9. Check Delta and Psi fitting and MSE value, click Calculated tab in the Selected Parameters Window to check Confidence Interval.
10. If data and fitting do not look good modify parameters and click Recalculate
11. Repeat this procedure until you obtain a best fit

Simulations:

Two types of simulations are available.

A) The first simulation allows you to input materials and thicknesses and compare the resulting graph to the data. If the index of refraction or chemical composition of your material is not well-known, this option may help you to find a reasonable fit, or see the effect of making that change.

- 1) Follow the Determination of Film Thickness steps 1-6. Set the thickness to a specific number, not a range.
- 2) Click the “**Simulate Fit**” button on the left side of the screen. The simulation will pop up on the Delta/Psi plots, and you can examine how the simulation based on these parameters compares with your data.
- 3) Continue changing parameters and clicking “Simulate Fit” as needed.

B) The second simulation method enables the user to determine which wavelength of light/angle/other parameters to use for a particular system. It can also be used to see what effect changes in n and k have on Delta or Psi, if the exact composition of your system is not well-known.

- 1) Click the “**Simulate**” button on the left side of the screen.
- 2) To select the variables you want to look at, click on one on list at the top of the screen and click “Add”. You are limited to two variables at a time.
- 3) Select the range of values for the variables using the “Range” window at the bottom. If looking at 1 variable, keep the number of points to less than 100. If looking at 2 variables, keep the number of points to less than 30 (for quickness of calculation and manipulation of the graph later).
- 4) Select the parameters to be simulated under “Simulated Parameters” in the center. Each parameter selected will show up as a separate line in one graph (if one variable is selected) or as a separate graph (if two variables are selected).
- 5) If you want the angle or wavelength to be set to one value, pick a value in the “Fixed Value” window.
- 6) Press OK and the graph will come up. If 2 variables are selected, a 3-D graph will pop up, which can be moved around by clicking and dragging (**Figure 4**). The value at a particular spot on the graph can be found by holding the mouse button down on that place in the graph.

Figure 1: Psi Fitting Window

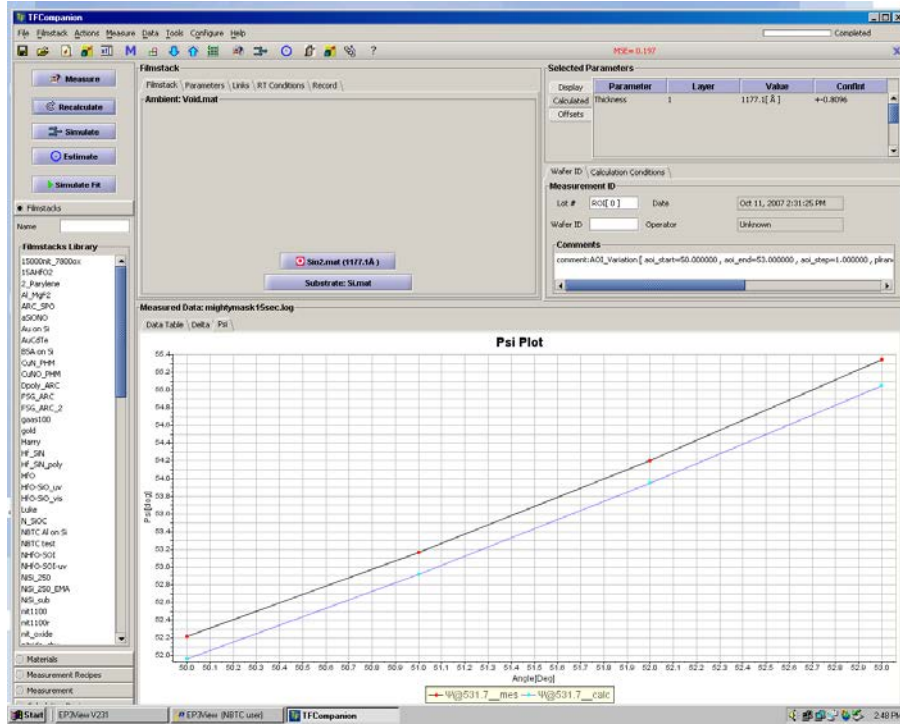


Figure 2: Custom Search Window

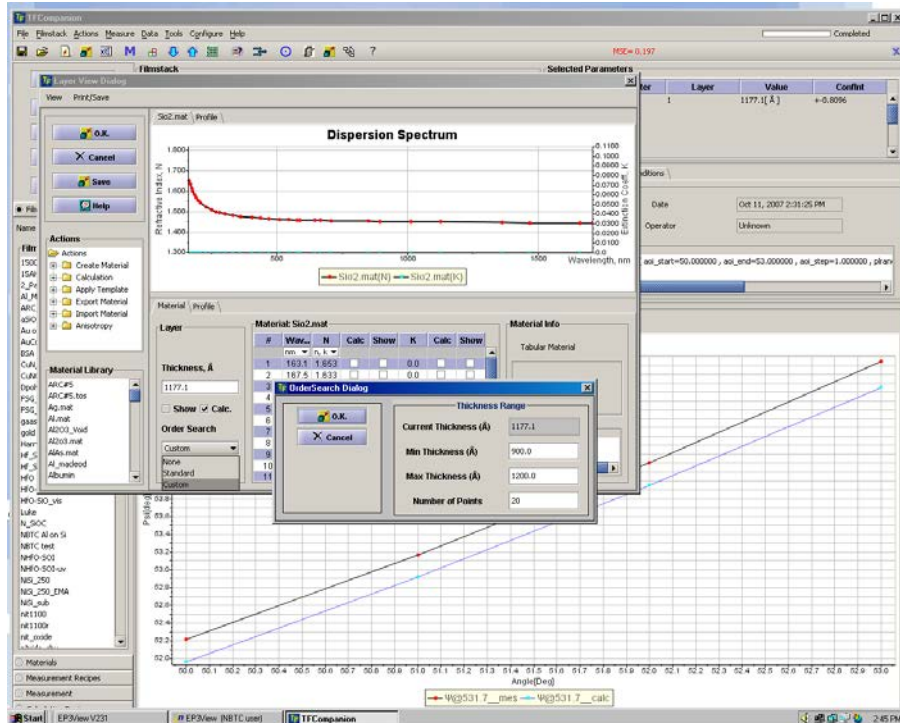


Figure 3: 3-D Simulation

