NanoFabrication Facility
ADVANCED SCIENCE RESEARCH CENTER

Standard Operating Procedure: Filmetrics

Contents

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Standard Operating Procedure: **Filmetrics**

Hardware Description and Principle of Operation

Filmetrics F20

The Filmetrics is used to measure the thickness and optical constants (n and k) of transparent and semi-transparent thin films. Measured films must be optically smooth and between 100 Å and 50μm thick. Commonly measured films include semiconductor process films such as oxides, nitrides, resists and polysilicon. Films that cannot be measured include very rough films and opaque films. The Filmetrics thin film analyzer is very useful for rapidly fine-tuning resist recipes and measuring etch rates.

Material Requirements

<u>Equipment</u>: substrate and tweezers

<u>Personal Protective Equipment</u>: nitrile gloves

Procedure

Estimated Time: ~15 minutes

Start Up Tool

1. Turn on the main power on the back of the lamp.
2. Turn on both the halogen and the deuterium light sources.
3. Wait at least five minutes for the lamp to warm up.
4. Turn on the lamp shutter.
5. Log in to the computer and start the FILMeasure software.

Baseline Reference Measurement

1. Select **Baseline** on the right side of the software window.
2. Place the sample to be measured on the stage and select **Take Sample Reflectance**.
3. Place either the Si or BK7 reflectance standard on the stage. You should choose the standard that is most similar to your sample.
4. Select the reflectance standard you are using from the drop down menu and select **Take Reflectance Standard**.
5. Remove any standard from the stage and select **Take Background**.
6. Select **Finish** when the baseline is done.

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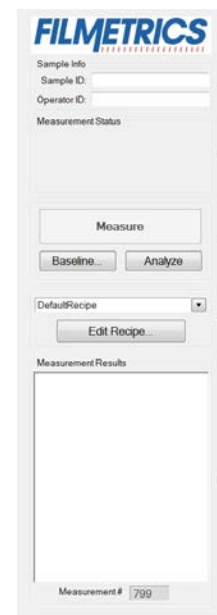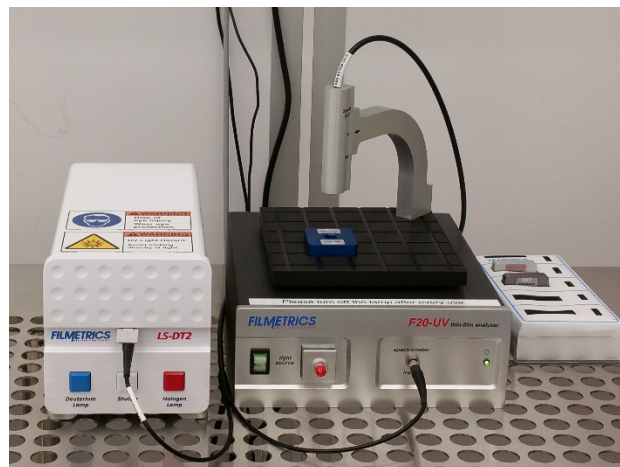
# Standard Operating Procedure: **Filmetrics**

Sample Measurement

1. Place the sample to be measured on the stage.
2. Select your recipe if you've previously created one and/or select **Edit Recipe** in order to create or edit a recipe.
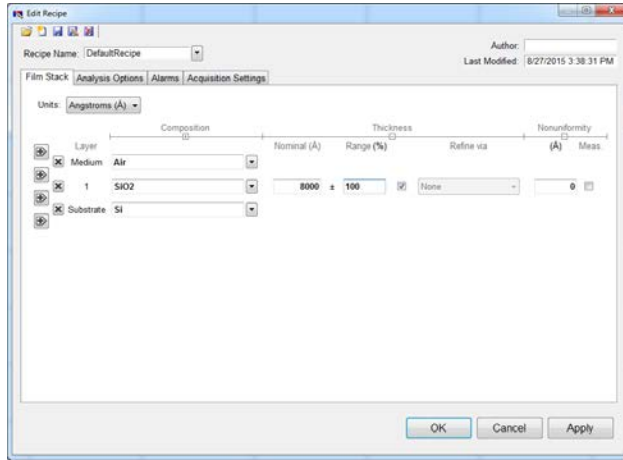

3. Select your substrate and your layers. Layers can be added or removed using the icons to the left of the film stack. Materials can be selected from the drop down menu for the layer.
   a. Note: If you have a new material not in the database, you need to know its optical properties, such as the index of refraction. You can simply enter an index of refraction instead of a material in a layer or you can create your own material in Material Library under the Edit menu, in which you can set n and k at specific wavelengths or determine n and k from customized parameters.
   b. **Note: Do not save over any material models that are already in the database.**
4. Set a nominal thickness and range under Thickness and set any non-uniformity you might expect.
5. Under Analysis Options, setup the Data Selection and Analysis Method best suited for your samples and measurements.

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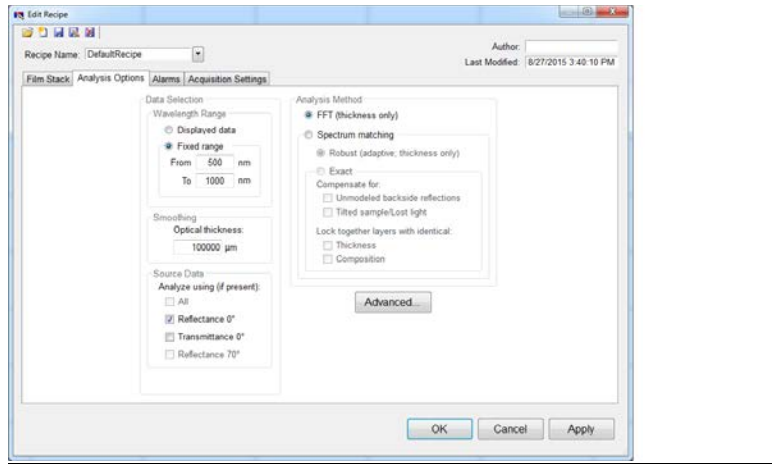
6. Once your recipe is setup, select **Measure** in the main window of the software.
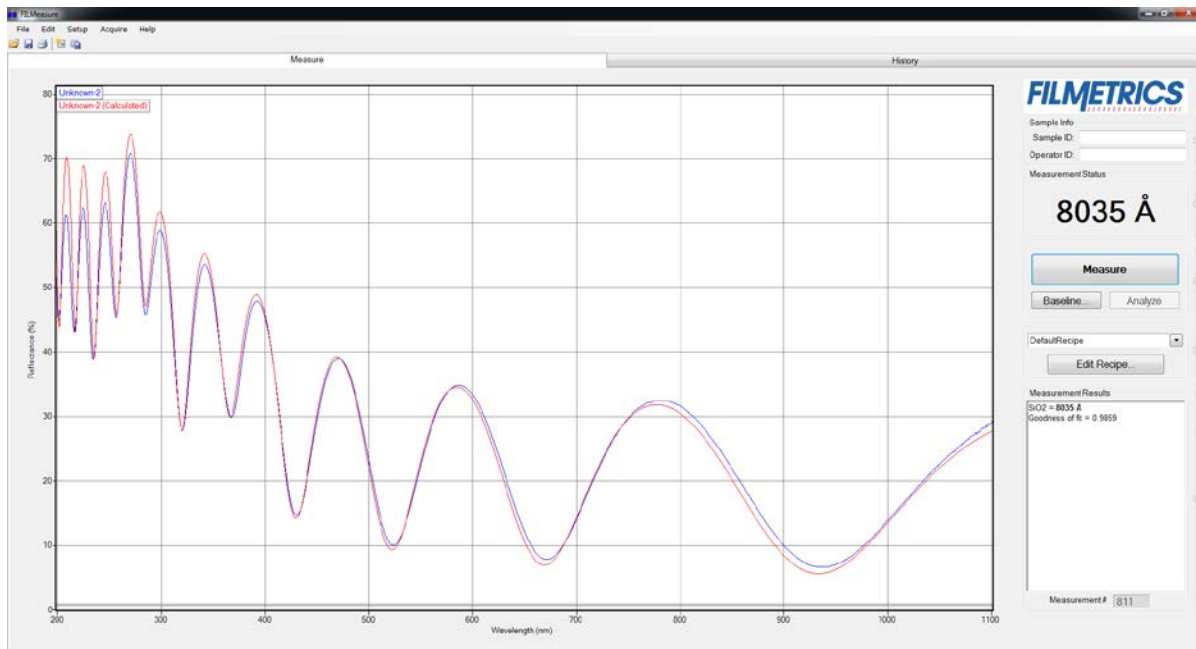
7. The tool will take a measurement and then create a fit to the data by adjusting the thickness of layers in the recipe. The thickness of the layers determined from the fit will be displayed.
8. If the match between model and data appears good and the goodness of fit is close to 1, then the layer thicknesses are likely close to the correct value. If it appears to be a poor match and the goodness of fit is low, the tool was not able to correctly determine the layer thicknesses.

Shutdown Tool

1. Close the FILMeasure software.
2. Turn off the lamp shutter.
3. Turn off the deuterium and halogen lamps.
4. Turn off the main power on the back of the lamp.

Allowed Activities

- Users can create models for their materials. Do not overwrite any existing material models.

Disallowed Activities

- Do not try to measure the film thickness of your eye.

What to watch out for during operation

- If certain ranges of wavelengths are not being measured, there may be an issue with one of the lamps.

Common Troubleshooting Tips

- Check that the shutter is open.
- Check that the lamps are on and working.
- If you are not getting a good measurement, try performing a new baseline.

When to call staff?

- Any of the lights on the lamp are blinking.

Badger Criteria

Report Problem:

- Either the halogen or deuterium lamp is not working.

Shutdown:

- The computer is not working.
- None of the lamps are working.

Revision History:

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