

1.0 Filmetrics F20 Thin-Film Analyzer

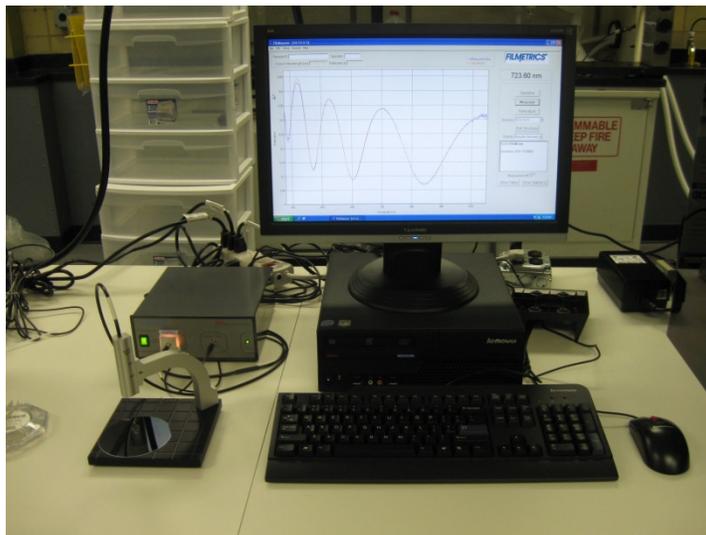


Figure 1: Filmetric F20 Thin Film Analyzer

1.1 Introduction

The Filmetrics F20 is used to measure the thickness and optical constants (n and k) of dielectric and semiconductor thin films. Commonly measured films include semiconductor process films such as oxides, nitrides, resists, and polysilicon, and optical coatings such as hardness and anti-reflection coatings, flat panel display films such as polyimides, resist, cell gaps, and various coatings used in CD and DVD manufacture. Films that cannot be measured include very rough films and metal films.

The F20 measures thin-film characteristics by reflecting light through the sample over a range of wavelengths. Because of its wave-like properties, light reflected from the top or bottom interfaces of a certain film can be in-phase so that reflections add, or out-of-phase so that reflections subtract depending on the wavelength. The result is a characteristic intensity oscillations in the reflectance spectrum (intensity vs. wavelength). In general, the thicker the film, the more oscillations there are in a given wavelength range.

Only trained and approved (qualified) Users may use this tool.

1.2 Features and Specifications:

- a) Regulated tungsten-halogen lamp with wavelength range 400 to 1000 nm.
- b) Light spot size ~ 1.5 mm.
- c) Film thickness range: 150 \AA to $50 \text{ }\mu\text{m}$.
- d) Film thickness range for measuring n and k : 1000 \AA to $5 \text{ }\mu\text{m}$.
- e) Accuracy: the greater of 0.4% or 10 \AA
- f) Precision: 1 \AA .
- g) Stability: 0.7 \AA .

1.3 Applicable Documents

- a) F20 operating manual - hardcopy located at machine.

1.4 Safety

There are no particular safety requirements other than those related to electronic instruments or computers.

CAUTION: Optical fibers will be damaged if bent or twisted. Do not touch those if not necessary.

1.5 Operating Procedure



Figure 2: F20 and sample stage.

1.5.1 Startup

- a) Activate the equipment in FOM
- b) Turn on the light source (green switch in Figure 2).
- c) Turn on the computer.
- d) Launch the FILMeasure program from the desktop.

1.5.2 Shut-down

- a) Close the FILMeasure software.
- b) Turn off the computer.
- c) Turn off the light source (green switch in Figure 2).
- d) Deactivate the equipment in FOM.

1.5.3 Quick Thickness Measurement

- a) Click on Edit Structure button.
Enter your sample's layer structure.
Enter your best estimate of film thickness.
- b) Click on Baseline button.
Place the reference wafer on the stage.
Specify the reference wafer material.

- Follow the instructions in the dialog boxes.
- c) Place the wafer to be measured on the stage.
Click Measure.
 - d) Thickness will be displayed.
 - e) If the measurement was successful, the minima and maxima of the calculated reflectance spectrum (red line) will coincide in wavelength with the minima and maxima of the measured reflectance (blue line).
 - f) Reference sample does not have to be the substrate material of the sample to be measured as long as it has the similar reflectance.
 - g) Note: To measure small patterns, if you don't see the light spot on your sample, use tweezers in the light path to locate the spot and move your pattern under it.
 - h) If you are measuring complicated structures and are having problems, read the manual or ask the staff.
 - i) Provide the necessary information in FOM and deactivate the instrument.