Boulder Optical Design

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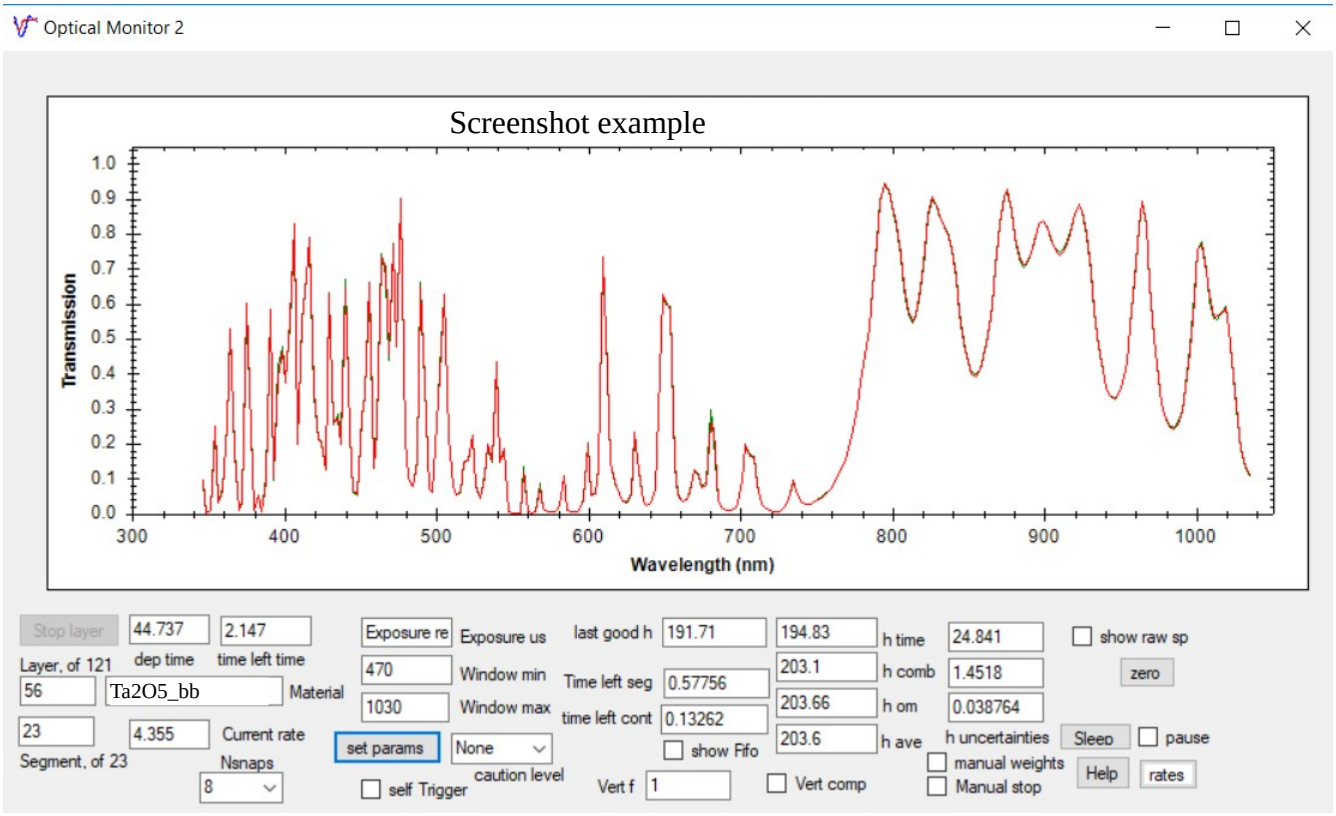
Broadband optical monitor system for thin film deposition

Introduction- Better and considerably less expensive than anything else out there. We provide software and also full support for development of hardware. Here is an example of an end-of-layer spectrum and the match to the theoretical design. (Theory and experiment are difficult to distinguish.)



Features-

- Works with full automation
- Works with planetary or high speed single-rotation, or other. Actual parts can be monitored, or witness parts that follow the same trajectory as actual parts can be monitored.
- Many features for pausing the run if something goes wrong.
- Data logging to a text file, including target and spectral data at each layer endpoint.
- The software has many convenience features, that are great for a production environment.
- Reads design from most popular thin film design packages, directly into the run.
- The normal system covers about 230 nm to 1100 nm, often part of this range is used for a run.
- Includes a separate Python script utility for reviewing log file results, which can easily be modified to fit into your process management system.

Level of thickness control- For a good chamber with the optical monitor system in place, layer thickness errors are typically 0.5 nm or less, random normal absolute thickness errors.

Discussion

Broadband optical monitoring is great for a wide variety of designs without significant design constraints.

The software is under continuous development, and latest updates are always available and free to existing customers. A new major revision is just coming out, that uses the newer spectrometer dll, newer software for the control hardware, and a newer plotting package.

The optical monitoring system was developed for fully automated IBS deposition, but we have also used the system in other types of chambers. Although we generally prefer to use transmission, we have also installed systems that monitor in reflection.

For systems with automation, we generally set the system up so that the whole run is automated. The chamber provides a layer start signal, and the optical monitor software provides a layer-stop signal when the optimum spectrum is achieved for that layer. There are other signals in both directions for pausing a run when various conditions are met. Many parameters can be changed on the fly, or controlled on a per-layer basis.

The system was originally developed for use with planetary motion. The system can monitor on actual parts, or (more commonly) on witness parts that follow the same trajectory as actual parts. This largely eliminates problems with part-to-monitor factors that plague other common monitoring systems. As a part passes, it takes multiple spectra. If the rotation is high speed, it measures several times on each part and then also averages for several turns. In this way the system takes full advantage of all times that the spectrum is available.

The system continuously monitors the development of the spectrum, calculates thickness, and assesses the health of the run.

Invitation for further discussion

We cannot fully describe the system in a short amount of space, and indeed each system tends to be at least somewhat unique. Suffice it to say that the system is amazing, and our expertise and support cannot be found elsewhere. We also fully respect your need for privacy, concerning your systems and processes. Please feel free to call and discuss the possibilities for your systems.

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