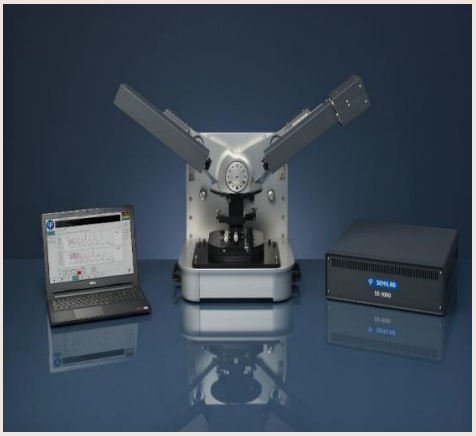

SE-1000 Spectroscopic Ellipsometer (Semilab, Hungary)

- Spectroscopic Ellipsometry is a non-destructive, high-precision optical technique used to determine thin-film thickness, optical constants (n & k) and layer structure with nanometer to sub-nanometer accuracy.
- The SE-1000 from Semilab (Hungary) is a high-performance, research-grade ellipsometer designed for measuring thin films, multi-layer stacks, semiconductor wafers, dielectrics, polymers, nanostructures, and coatings across the UV-Visible-NIR range.
- It is widely used in materials science, semiconductor R&D, photovoltaics, optics, coatings, nanotechnology, and thin-film characterization

Instrument Capabilities

- Measures thin-film thickness from 0.5 nm to several micrometers
- High-accuracy measurement of Psi (Ψ) and Delta (Δ) parameters
- Measures refractive index (n) and extinction coefficient (k)
- Ultra-stable optical design with high wavelength precision
- Supports multi-layer modeling and optical dispersion models
- Measures:
  1. Film thickness
  2. Optical constants
  3. Composition
  4. Roughness
  5. Graded layers
  6. Interfaces
- Fast data acquisition with high signal-to-noise ratio
- Equipped with auto-alignment and beam-tracking technology
- Compatible with mapping stage for wafer-scale uniformity

Sample Type

- Thin Films
- Multi-layer optical coatings
- Semiconductor wafers
- Glass substrates
- Polymer films
- Oxides, nitrides, metals
- Organic & inorganic coatings
- Nanostructured layers

Sample Preparation

Follow these guidelines for best SE-1000 measurements:

- Clean the sample to avoid optical scattering due to dust or contaminants.
- Make sure the **surface is flat and reflective** (SE requires reflected light).
- Avoid fingerprints and moisture—use **IPA and lint-free wipes**.
- Ensure **uniform sample placement** on sample stage.
- For films deposited on transparent substrates:
    - Place an **absorbing backing** if needed.
- Keep the sample dry—no droplets, smudges, or surface roughness.
- Calibrate against a **known reference wafer** before measurements.
- Ensure stable temperature to avoid refractive index fluctuations.
- Ensure that your cuvettes are as clean as possible. If you can, put them through a standard glass washing procedure. At the very least, they should be rinsed with the last used solvent and a rinsing agent, such as acetone, deionized water or IPA.
- Before loading your sample, you should rinse the cuvette with the solvent that your sample is dissolved in. This should help remove any residual solvents left over from cleaning, which could contaminate your measurement.
- Any reference measurement, such as for absorbance spectroscopy, should be taken of the cuvette filled with the diluting solvent. This will ensure that your measurement will account for any optical effects introduced by the quartz cuvette or the solvent.
- Use an appropriate sample concentration. If your sample is too concentrated, the beam will not be able to penetrate through the sample, and no light can be measured by the spectrometer. If your sample is too dilute, light may pass through your sample without interacting with the sample material at all.
- Optimize the path length for your experiment. A cuvette's path length is the distance that light travels through the sample before it escapes and is measured by the spectrometer. Using a cuvette with a smaller path length can be useful if you cannot reduce your sample concentration without significantly changing your results.
- Additionally, you can use a cuvette with a smaller path length to reduce the volume of sample needed. This can be especially useful if you have a small amount of sample or if your material is expensive.
- Ensure your spectrometer has a sample holder which accommodates your cuvette. The positioning of your cuvette relative to the spectrometer and light source should remain consistent throughout and between experiments. Your sample should also stand "face on" relative to incoming light to reduce any scattering effects. For example, the Ossila Optical Spectroscopy Kit contains a cuvette holder compatible with standard Quartz cuvettes.
- Always ensure that your samples are completely dissolved in your chosen solvent. Wherever possible, filter solutions before using to remove contaminants.

Measurement Range

- **Spectral Range: ~ 380 nm – 1000 nm** (in visible range)
- **Thickness Range: 0.5 nm to 20 µm**
- **Angle of Incidence: 45°–90°** (motorized)
- **Resolution:** Sub-angstrom level for ultra-thin films
- **Detector System:** High-sensitivity photodiodes + spectrometer

Applications

- Thickness & optical constant measurement of thin films
- Semiconductor dielectric analysis (SiO_2, Si_3N_4, Al_2O_3, HfO_2)
- Optical coatings & multilayer stacks
- Solar cell layer characterization (TCOs, perovskites, amorphous Si)
- Polymer film analysis
- Surface and interface roughness measurement
- Nanostructure optical property extraction
- OLED & display materials
- MEMS/NEMS thin-film verification
- Refractive index dispersion curve generation
- Real-time film monitoring (with in-situ configuration)

Advantages

- Completely **non-contact**, **non-destructive**
- Extremely **high accuracy** and **repeatability**
- Broad spectral range for wide material compatibility
- Industry-standard analysis software (Semilab SEA)
- Works for **conductive & non-conductive** samples
- Excellent for **multi-layer optical modeling**
- Suitable for both **R&D** and **production environments**

References

- Semilab SE-1000 Brochure
- Semilab Technical Application Notes
- Optical Modelling Handbook – Semilab
- Standard ellipsometry textbooks for Ψ-Δ analysis