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Real-Time ellipsometric spectra without systematics errors

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In real-time measurement, it is difficult to reduce systematic errors on spectra of ellipsometric angles Ψ and Δ by the mean of two measurements at two analyzer positions with the incidence plane +45° and -45° [1-2]. Generally, the analyzer is mounted on a motorized rotation stage. The rotation of the optical component from -45° to +45° requires few seconds, and this is incompatible with dynamic measurements.

Real-time Spectroscopic Rotating Compensator Ellipsometer (RTSRCE)

- Based on a rotating compensator technology [3] using two detectors in the visible domain (400-800nm).
- The analyzer is replaced by a fixed Rochon birefringent beamsplitter which splits the incidence light wave into two perpendicularly polarized waves, one oriented at +45° and the other one at -45° according to the plane of incidence.
- The two emergent optical signals are analyzed by two identical CCD detectors.
- The final spectrum is the result of the two averaged Ψ and Δ spectra acquired by both detectors.
- Ψ and Δ spectra are acquired without systematic errors on a spectral range fixed from 400 to 800nm. The acquisition time can be adjusted down to 25ms

The systematic errors

Data acquisition are synchronized by a specially dedicated software.

In situ ellipsometric monitoring of electrocrystallization of Bismuth telluride films

Electrochemical cell used for the experiments

Simultaneous and synchronous records of:
- Optical data: Ψ and Δ spectra
- Gravimetric data: Electrochemical Quartz Crystal Microbalance
- Coulometric data: Potentiostat

Acquisition times:
SE: 50 ms/EQCM: 160 ms/ potentiostat: 100 ms

Optical model

Fitted parameters
Material volumic fraction f (%) thickness t (nm)

References