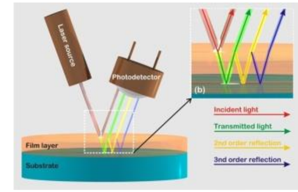
ThetaMetrisis APPLICATION NOTE #049

Fast and accurate mapping of Y_2O_3 layer thickness on large alumina ceramic discs



Introduction:

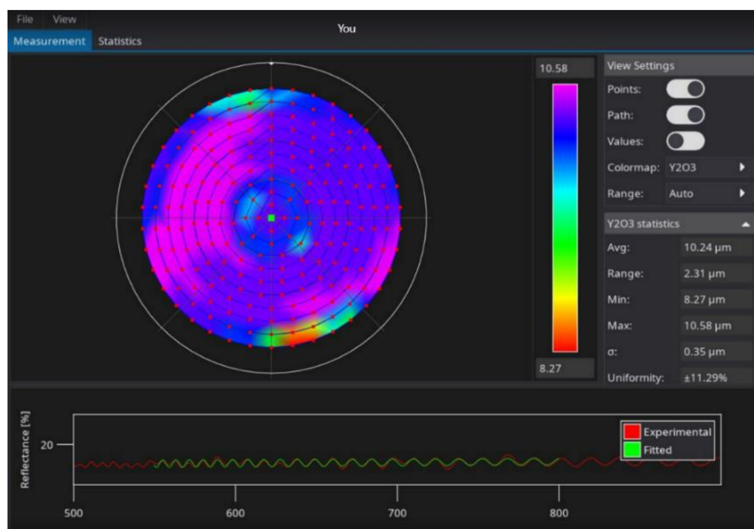
Continued reduction in feature dimension in integrated circuits demands high degree of flatness after chemical mechanical polishing. **Yttrium oxide (Y_2O_3),** is a great promising and creditable material to be used as abrasive for chemical-mechanical planarization (CMP) for a wide range of applications. Y_2O_3 due to its extremely high temperature stability and its outstanding resistance to alkaline melts with high oxygen affinity, is also used in numerous special applications such as in insulators, glass, electrical conducting ceramics, refractories, stains. Other applications include light-transmitting material in various fields such as lenses, prisms or glass, as a suitable buffer layer in metal-ferroelectric-insulator-semiconductor, structure for single transistor FeRAM. In this application note, a **ThetaMetrisis FR-Scanner** is used for thickness mapping of Y_2O_3 on alumina ceramic disc.

Means & Methods:

Sample under characterization was a **560mm diameter alumina disc** with Y_2O_3 layer. The measurement was carried out with an FR-Scanner VIS/NIR, operating in the **370nm-1020nm spectral range**, and capable to measure thickness of coatings from 15nm up to 100um. The tool scans the sample under test by rotating the stage and by moving linearly the sample (polar scanning). The pattern generated through FR-Scanner software, includes 208 points in (R, theta) positions across the surface of the sample.

Results:

In images below, typical recorded reflectance spectra (red line) and fitted reflectance spectra (green line), as seen on the FR-Scanner software, of Y_2O_3 layer, are illustrated along with the mapping profile. In order to determine the accuracy and repeatability of the tool the scanning was repeated for several times giving the following statistics.



Y_2O_3 mapping statistics

Average Thickness	10.24um
Minimum Thickness	8.27um
Maximum Thickness	10.58um
Uniformity	±11.29%

Thickness Mapping of the Y_2O_3 layer on top of Alumina Ceramic Disc.

Conclusions:

Thickness mapping of Y_2O_3 layer of an aluminum ceramic disc was evaluated by using a FR-Scanner. In addition, the film was successfully characterized by means of thickness measurements, thickness mapping over the wafer area and statistical analysis of the thickness uniformity. FR-Scanner is the fast and accurate solution for characterization of single films or stack of films over large areas or preselected positions through scanning.

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