

## Precise Characterization of Optical Waveguide by Spectroscopic Ellipsometry (SE)

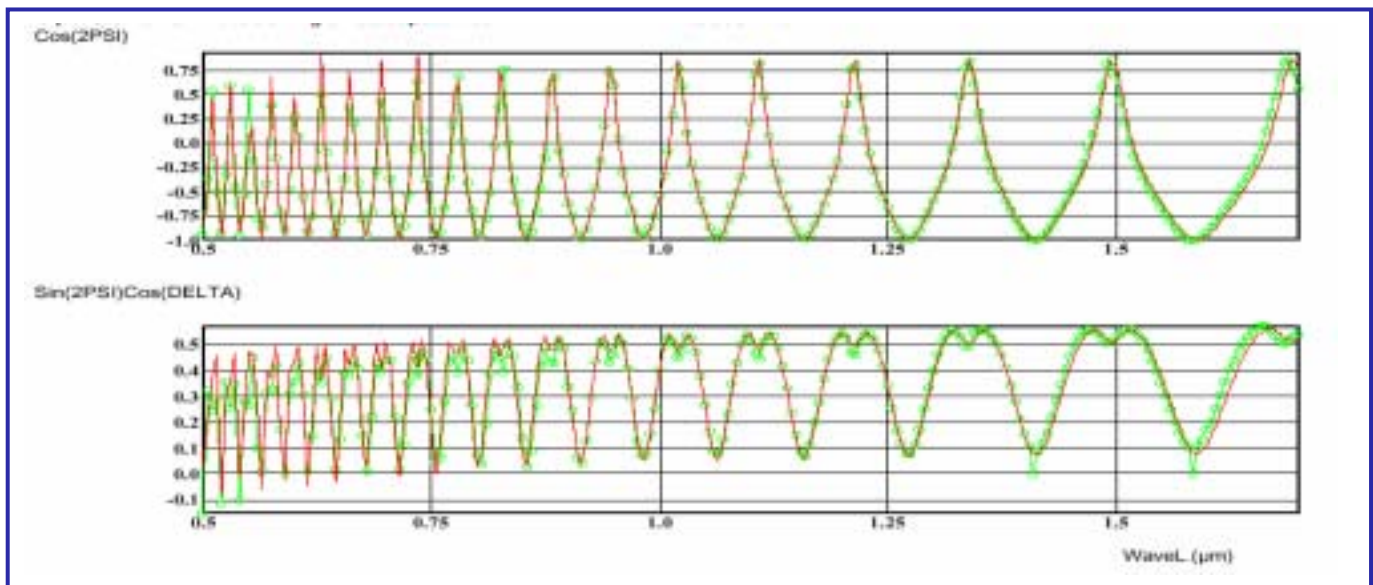
Precisely knowing the material optical constants and layer thickness is very important for waveguide manufacturing. Ellipsometry, known as an absolute, non-contact, non-destructive optical technique, has been widely used for precise characterization of thin films layer thickness and material optical constants. The technique determines the changes in the polarization state of the light after its interaction with the sample. A typical ellipsometer comprises a light source, a polarization generator (Polarizer), an Analyzer, and a light intensity detector SOPRA variable angle *Spectroscopic ellipsometer* (SE) operates over a very wide spectral range. It allows very precise and accurate characterization of optical waveguides as demonstrated through the

**SOPRA GES-5 Angular SE**



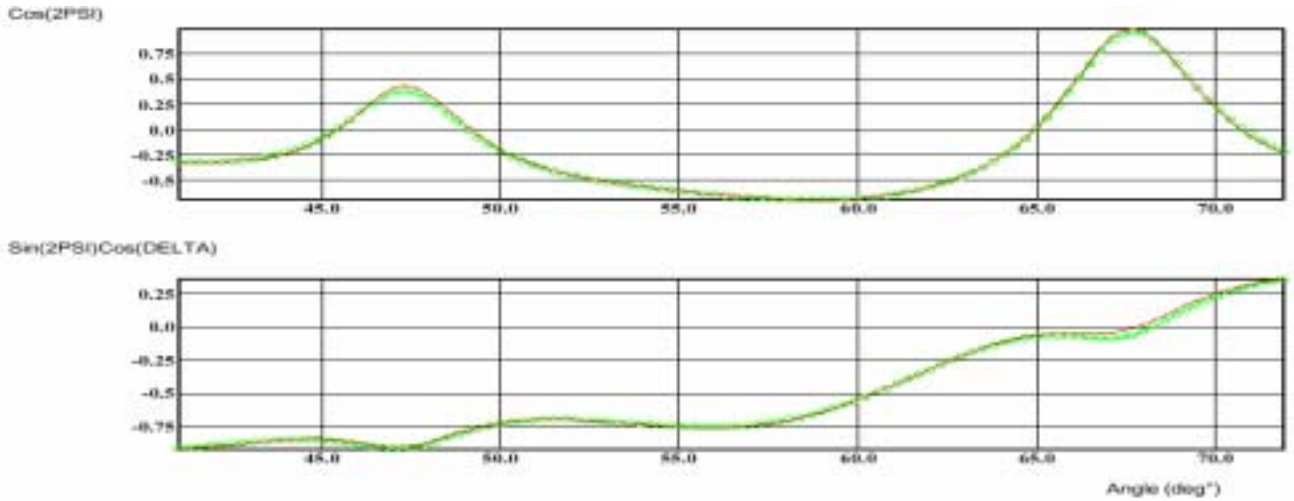
**Example: Waveguide Characterization with Spectroscopic Ellipsometer SOPRA Model GES-5**

Stack	Thickness ( $\mu\text{m}$ )	Refractive Index @1550nm
SiO <sub>2</sub>	5.840 ± 0.001	n = 1.4556 & k = 0
Si Substrate		n = 3.477 & k = 0



Refer to SOPRA web page ( [www.SOPRA-SA.com](http://www.SOPRA-SA.com) ) for tutorial on SE principles, terminology and products.

**Example: Waveguide characterization with varying incident angle, fixed wavelength 1550nm**



**Table: Repeatable measurement and analysis for waveguide SiO2**

Wafer 05		Thickness ( $\mu\text{m}$ )		Optical Index (@ 1.55 $\mu\text{m}$ )
<b>Center - Repeatability</b>				
1		5.8400		1.45548
2		5.8399		1.45549
3		5.8400		1.45549
4		5.8403		1.45544
5		5.8402		1.45545
6		5.8401		1.45546
7		5.8401		1.45547
8		5.8401		1.45548
9		5.8402		1.45547
10		5.8402		1.45546
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mean		5.8401		1.45547
standard deviation		0.0002		0.00002

**It is shown here that variable angle spectroscopic ellipsometer offers very precise characterization for both thickness and optical constants which is essential for waveguide applications.**

**Please contact us for more information.**

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