



Application Note

Application Example: Anti-Reflectance Coating On Patterned Glass For Solar Applications

Application Challenge:

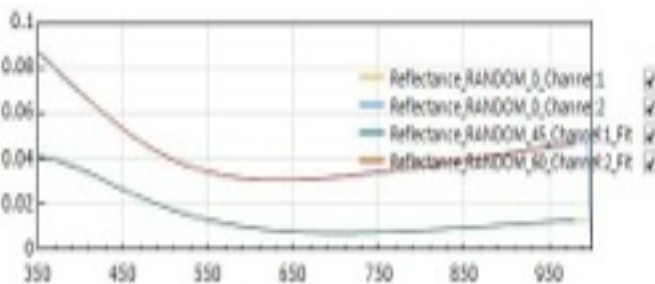
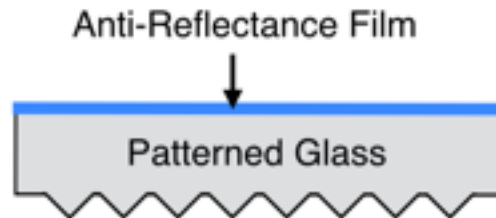
- During the process characterization for AR coatings, there is a need to measure simultaneously the thickness and index of refraction of the low index anti-reflectance coating on patterned glass.
- Typically, an ellipsometer is used to measure the thickness and index of refraction simultaneously because the ellipsometer measures two parameters, Delta and Psi (the ratio of reflectance of two polarizations and the phase difference). Another drawback for ellipsometers is the precise sample tilt requirement.
- A simple reflectometer cannot precisely and accurately measure the thickness and index of refraction simultaneously because there is only one measurement parameter (the reflectance value), unless the coating is thick. However, for AR coatings, the thickness is thin typically about 100 nm.

In our method, we use a two channel reflectometer at two angles 45 and 60 degrees. Thus we have two information from which we can reliably extract the thickness and index of refraction.

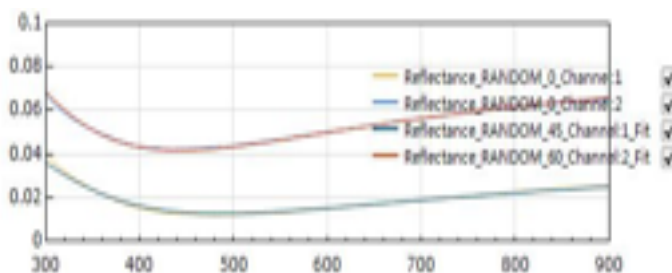
Our optical system design makes our measurement more reliable and the analysis software accurately models the full response of the anti-reflectance coating on substrate glass. This can be seen in the excellent model fit to the 2 channel reflectance data as shown in the figure below.

Table: Summary of advantages of compared to other measurement methods

Measurement Method:	Simultaneous measurement of thickness and n	Sensitivity to sample tilt or local surface variation
Single Channel Reflectometer	No, unless film is thick	Sensitive; compensated by modeling
Ellipsometer	Yes	Very sensitive
Apris (two-angle reflectometer)	Yes	Less sensitive due to optics design and modeling



Measurement Results:
ARC thickness: 149.2 nm
 n at 550nm is 1.377



Measurement Results:
ARC thickness: 103.6 nm
 n at 550nm is 1.359

Figure: Two angle reflectance (45 and 60 degrees) with simultaneous fitting to measure thickness and index of refraction n of two samples of AR coating on patterned glass

Performance

Performance Specification:	
	Specification
* Repeatability for n	0.005
* Repeatability for thickness	1 nm

* Repeatability is 1 standard deviation of 30 measurements on a stationary sample.

* Repeatability was measured on approximately 120nm AR coating on glass substrate.