

SOPRA licenses ellipsometric porosimetry (EP) technology from IMEC

June 16 2004

Leuven, Belgium, June 16, 2004 --- SOPRA has signed an exclusive license agreement on IMEC's patented ellipsometric porosimetry technology. IMEC, Europe's largest independent microelectronics and nanotechnology research center, pioneered ellipsometric porosimetry in the mid 90's and built its own R'nD ellipsometric porosimetry (EP) tool a few years ago. It is now one of the key analysis tools of IMEC's Advanced Interconnect Solutions R'nD Program. The R'nD EP tool was extensively benchmarked with other porosimetry technologies (e.g. PALS, SAXS, SANS) and excellent agreement was demonstrated. SOPRA will have its first commercial products using EP ready for shipping in Summer 2004.

Ellipsometric porosimetry (EP) allows to cost effectively monitor the porosity, pore size distribution (PSD), cumulative surface area (CSA) and pore interconnectivity in thin films deposited on top of any solid surface on a wafer level scale. EP measures the change of optical characteristics of thin films during the vapor adsorption and desorption. All measurements are carried out at room temperature using an organic adsorptive. Ellipsometric characteristics $\cos D$ and $\tan Y$ are plotted as function of time and pressure.

Further analysis includes:

- Calculation of the refractive index (n) of the film during the adsorption using the fundamental equation of ellipsometry;
- Verification of the film swelling by comparison of the adsorption and desorption isotherms in D/Y coordinates;
- Calculation of the adsorbate amount in the film by Lorentz-Lorenz

equation.

- Calculation of full porosity, open porosity, pore interconnectivity and specific (cumulative) surface area.
- Calculation of Pore Size Distribution (PSD) by the Kelvin and Dubinin-Radushkevitch equation down to 1nm diameter.

The same tool can be used to study thermal stability and modification of the film during the outgassing.

EP with a plasma source allows to study plasma resistance and modification of materials in active plasmas and plasma cleaning of different surfaces. IMEC has also developed novel applications such as pore sealing tests and Young's modulus extraction of low-k dielectrics using the EP technique.

The EP software allows calculating all above-mentioned characteristics. Complete analysis including measurements and calculations does not exceed 2 hours.

"Ellipsometric porosimetry has been a key enabler to study low-k materials properties as well as some of their integration issues", explains Rudi Cartuyvels, Director Interconnect Technologies & Technology Options at IMEC. "We are confident that our partnership with SOPRA will bring a best-of-class EP solution to the semiconductor industry."

"SOPRA, a pioneer and specialized company in Spectroscopic Ellipsometry, will use its patented SE technology, including the use of optical fibers and measurement through an horizontal flat window, to complement the EP technology. Several EP models with gradual automation capabilities will be offered, from the manual EP 5 to models with mapping capabilities for 8 and 12 inches wafers." said Marc Stehlé, CEO of SOPRA.

The EP technology is unique for ultra low k materials characterization.

Many material parameters can be extracted from a single non destructive measurement. It also permits to measure the liner or barrier integrity by detection of sealing defects, which is key to ULK process integration on real products.

SOPRA will benefit from the long and constant development efforts made at IMEC, and bring its 20 years industrial experience on SE to make robust products for the laboratories and for the industry. There are several new applications which can be addressed by the EP technology and the fruitful relationship between IMEC and SOPRA will permit to develop them .

SOPRA develops and manufactures SE instrumentation from 140nm to 18 μ m, for research, in line and in situ metrology. GXR reflectance is added on SE for very thin films and high K dielectrics applications.

This new EP product line will be the next contribution of SOPRA to the research and semiconductor industry.

The original press release can be found [here](#).

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