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Launched since 2005 for our french speaker ellipsometer users, the «HJY Ellipsometer Newsletter» is now translated in english and distributed worldwide !

It was for us very important to share with the largest audience a very big event which was the launch of our new thin film measurement tool called the **Auto SE**.

This new instrument represents a technological shift for ellipsometry, easy-to-use, dedicated to film thickness measurement and quality control of thin films, integrating a very innovative feature «the MyAutoView vision system».

In parallel, the **UVISEL**, the 1st phase modulated ellipsometer launched 20 years ago, shows many new improvements, new options, new wavelength range, a new low cost configuration, etc...

In this world of technological innovations, scientific instrumentation has to suit research and industrial needs. And **HO-RIBA Jobin Yvon - Thin Film Division** will look to the ellipsometry future especially in the fields of nano and bio technologies through the European project **NanoCharm**.

This letter is also yours, and your remarks and comments to improve this letter will be of great help. In the last part of this newsletter, we traditionnally present the new members of the club, that will certainly help to create a useful ellipsometry network !

Mélanie GAILLET
Marketing & Communication Manager

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User Club

- **Subscribe to the Newsletter !**

News

• Spectroscopic Ellipsometry 2008 Training Courses

The ellipsometry training course program is designed every year for our customers. Two sessions «Level 1» and «Level 2» are proposed respectively to become familiar with the ellipsometer tool plus sample analysis and for experienced users. Training sessions available in the program are held in our headquarters office based in Chilly-Mazarin, France. Worldwide on-site training courses are also available as well as training courses managed directly by the HORIBA Jobin Yvon subsidiaries equipped with an application lab, based in the USA, Germany, and Japan.

2008 Training Course Calendar

Course Title	Date	Fees
Spectroscopic Ellipsometry - Level 1 Basics		
Learn how to use the ellipsometer for the measurement and analysis of simple samples	25-26 June 03-04 December	800€
Control of modelling techniques and practical sample analysis	27 June 05 December	300€
Spectroscopic Ellipsometry - Level 2 Improvement		
Improve your experience in the analysis of complex samples	10-11 April	800€
DeltaPsi2 software and its numerous functions	12 April	300€
Customized Training Course		
Personalized support for sample measurement analysis	Scheduled at your request	

There has been a strong demand this year for ellipsometry training courses. At the mid-of the year, the french sessions organized in Chilly have been full, and there was a strong increase of on-site training sessions. These ones provide the advantage to train a large number of users in a unique place and suit customer's requests.

More information or for a training inquiry:

Contact: the HORIBA Jobin Yvon subsidiary or representative of your country or send an e-mail to: tfd-marketing@jobinyvon.fr

Programme Download:
<http://www.jobinyvon.com/Thin-Film/Support/Training>

• Shows & Conferences 2008

This will be the main places this year where you can meet us.

We encourage you to visit the home page of the www.jobinyvon.com web site, which displays each month the main events.

Date	Shows	Place
10-11/07	IS-FOE	Halkidiki, Greece
8-11/07	MOLMAT 2008	Toulouse, France
14-16/07	NN-08	Thessaloniki, Greece
25-29/08	11 ^{ème} journées de la matière condensée	Strasbourg, France
15-18/07	Semicon West	San Francisco, USA
27-29/08	PORANAL Symposium 2008	Debrecen, Hungary
01-04/09	23 RD European PV Solar Energy Conference	Valencia, Spain
06-08/10	SFEAP	Tours, France
08-10/09	AOFA	Soest, Germany
09-11/09	Semicon Taiwan	Taipei, Taiwan
15-19/09	EMRS Fall Meeting	Warsow, Poland
15-19/09	PSE	Garmisch, Germany
16-18/09	ThGOT	Jena, Germany
30/09 - 02/10	Opto, Mesure expo	Paris, France
29/09 - 01/10	OSC08	Frankfurt, Germany
17-20/11	ICTF14	Ghent, Belgium



Forum Labo, Paris, June 2008

**• Vote for Auto SE!
Shortlisted at EuroAsia 2008 Award**



We are proud to announce that the new **Auto SE** has been shortlisted for the **EuroAsia Sub System/Component Provider - New System Award 2008**

Now until the winners are announced on October 7th at SEMICON Europa, the time is now to maximize the votes for **Auto SE**.

That's why we kindly ask for your votes !

- Visit:
http://www.euroasiasemiconductor.com/awards_vote.php

- You can vote via the EuroAsia e-newsletter if you received it.
- Or visit www.jobinyvon.com and click on the **Auto SE Award 2008** banner (soon available)

• **UVISEL⁺ RM: Spectroscopic Ellipsometer⁺ with Integrated Reflectometry Module**

The UVISEL⁺ **RM** extends the capability of the UVISEL with a **new independent Reflectometry Module (RM)** that can be mounted on the UVISEL goniometer. The low cost **RM** module is available either as an option or as an upgrade for all current models of the VISible and NIR UVISEL Spectroscopic Ellipsometers as the module is simply connected to the Xenon lamp and monochromator of the UVISEL via two optical fibres.

Reflectometric Module

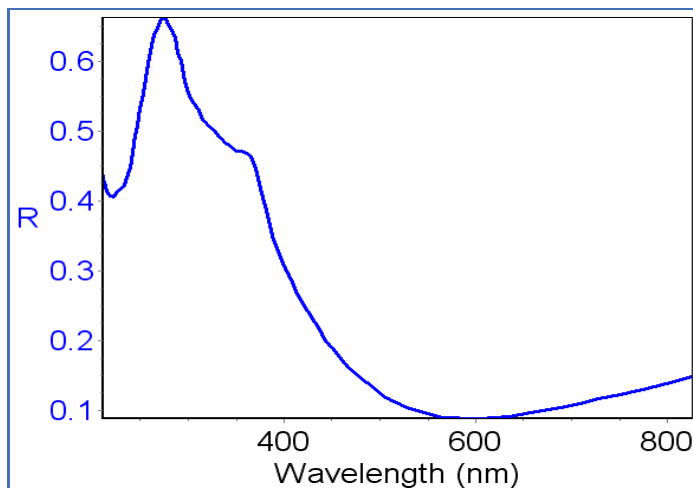


UVISEL⁺ RM

The RM allows Reflectance measurements at normal incidence over the wavelength range 210nm - 2100 nm with a 200µm measurement spot, and through the integration of ellipsometry and reflectometry the UVISEL⁺ **RM** enables flexible and accurate measurements of:

- Thickness of single and multiple layer films ranging from 1Å to 30 µm,
- Optical properties (n, k, α) of materials,
- Direct spectroscopic measurement of sample reflectance,
- Precise description of thin film stacks for interfaces, roughness, inhomogeneities...

The UVISEL⁺ **RM** is simple to operate using the DeltaPsi2 acquisition system and benefits from the large materials database and powerful analysis features of the software. For difficult applications it is possible to bind both ellipsometry and reflectometry measurement for the analysis of a sample.



Spectroscopic Reflectance of NIST SiO₂ [100nm] / Si

The UVISEL⁺ **RM** is a flexible spectroscopic metrology platform that is ideal for photovoltaic, display, optical coatings and surface treatments applications.

• **New UVISEL LT, ideal for textured photovoltaic samples**

The new UVISEL LT is a spectroscopic phase modulated ellipsometer with a new achromatic optical design.

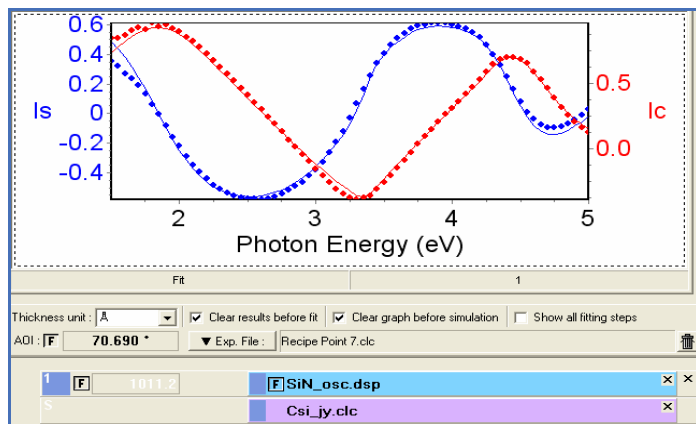
The instrument has been developed for **absorbing and diffusing samples, such as textured samples used in photovoltaics**, as the UVISEL LT offers a more intense signal that is useful for the accurate measurement of such samples. Two spectral ranges are available 210 - 880 nm and 245 - 2100 nm.

In common with all UVISEL instruments the UVISEL LT is controlled by the DeltaPsi2 software package.



UVISEL LT

➤ **Measurement of textured sample SiN on c-Si:**



Parameters

1) L1 Thickness [Å]	=	952.676 ± 11.826
2) SiN_osc εs	=	4.0848 ± 0.0792
3) SiN_osc ωt	=	8.0700 ± 0.1031
4) SiN_osc Γ ₀	=	3.2574 ± 0.1231
5) AOI	=	70.992 ± 0.181

Remark : it is advised to fit the angle of incidence for rough photovoltaic cells.

More info on UVISEL LT, RM and Auto SE:

Contact the HORIBA Jobin Yvon subsidiary or representative of your country or send an e-mail to:
tfd-sales@jobinyvon.fr

• **5th Workshop Ellipsometry Announcement**

The 5th workshop on ellipsometry will be held in Zweibrücken, Germany from 2nd to 4th March 2009.

These ellipsometry workshops are organized every two years, generally in Germany, whereas the international conference on ellipsometry is held every four years.

Submission of abstracts is possible until 15th of November 2008.

More information on workshop topics can be found on the web site: <http://www.wse-2009.de>

• **New European Project NanoCharm**

HORIBA Jobin Yvon - Thin Film Division is involved in the European project «NanoCharm» - Multifunctional Nanomaterials Characterization Exploiting Ellipsometry and Polarimetry.

The global demand for nanomaterials is expected to reach US\$3.7 billion this year alone (2008), driven mainly by nanoscale metals and oxides. European developers and users of nanomaterials will be constrained by bottlenecks in characterization techniques, many of which are slow, expensive and inefficient.

The goal of NanoCharm is to serve the world of Nanotechnology, NanoApplications and NanoCommunity via an efficient

platform which facilitates access, information, communication, education, etc... to ellipsometry and polarimetry techniques.

The consortium is composed of seven partners:



CNR-IMIP, Bari; Maria Losurdo



CNRS-LPICM, Palaiseau; Antonello de Martino



JKU-Linz; Kurt Hingerl



ISAS-Berlin; Norbert Esser



Brno-University; Josef Humlicek



IF-Belgrade; Rados Gajic



HJY, Paris; Denis Cattelan



IoN-Edinburgh; Otilia Saxl

More info: www.nanocharm.org



- Subscribe to the NanoCharm Newsletter !
- Nanocharm organizes the first European School on Ellipsometry, that will be held in Bari - Italy, 21-25 September 2008.

Very Charming, is not it ?

Technical topics

• **Discover the New Auto SE !**

The Auto SE is a unique instrument fully automated and easy-to-use for the measurement and quality control of thin films.

Thin films, surface treatments, intelligent and functional coatings are in constant increase in the industries of optics, photovoltaics, automotive, glass, biosensors, etc...

The **Auto SE** has been introduced to simplify thin film analysis whilst maintaining the major advantages of ellipsometry - non-destructive analysis, thickness angstrom accuracy, multi-layer measurement capability.



Auto SE

It allows full automatic analysis of thin film samples with simple push-button operation.

Sample analysis takes only a few seconds and provides a complete report that fully describes the thin film stack - including film thicknesses, optical constants, surface roughness and film inhomogeneities.

The integrated **MyAutoView vision system** is an innovative and patented feature allowing the user to view the sample and to optimize the choice and the position of the measurement spot on the sample.

The automated XYZ table automatically loads and optimises sample settings for the measurement.

Height measurement spots and micro-spots are available useful for cases where the sample is patterned or has poor surface quality.

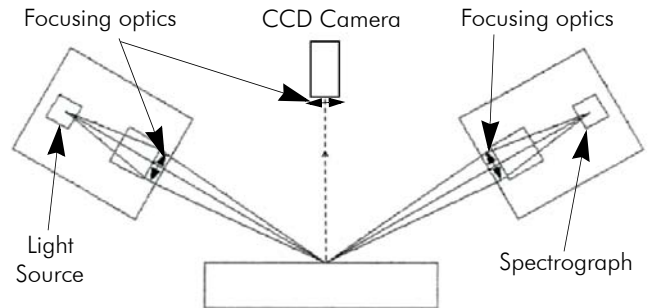
The **Auto SE** also offers a **large choice of accessories** (such as temperature controlled cell, liquid cell, electrochemical cell, 360° rotation control, transmission mount, plastic film mount, curved sample mount, etc...) to accommodate a wide range of experiments and sample shapes.

Providing built-in diagnostic indicators for the automatic detection and diagnosis of problems, the **Auto SE** guarantees optimal efficiency and productivity.

The **Auto SE** is a turnkey instrument ideal for routine thin film measurement and quality control, from research to industry.

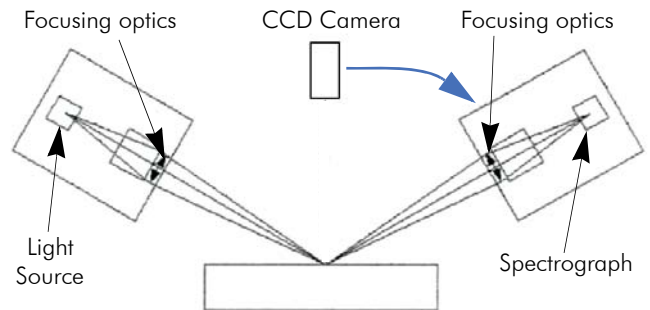
Overview of MyAutoView Vision System

Since 1st ellipsometers appeared on the market over 20 years ago, ellipsometric measurements were Blind ! The **Auto SE** is the 1st spectroscopic ellipsometer to provide a **Vision System intelligently integrated into the optical design of the ellipsometer.**



Standard Imaging Design

CCD camera placed at normal incidence. To visualize an image the sample must diffuse light, restricting its range of applications.



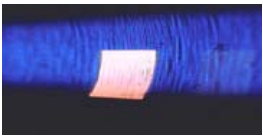
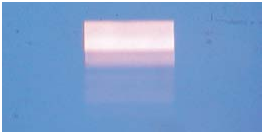
MyAutoView Design

CCD camera is placed in the optical head allowing the visualization of all samples.

The image provided has a field of view of approximately 1mm² and a resolution of 10 μm.

A unique advantage provided by MyAutoView concerns **transparent substrates such as glass, plastic films, etc...** as the vision system enables the direct visualization of the front and back reflections of the transparent substrate. **Hence measurements of transparent substrates made easy !**

Sample Type	Advantages of MyAutoView	Examples
Patterned sample	Direct visualization of the measurement spot on the pattern area	
Sample with an inhomogeneous surface (stripe, strain)	Optimization of the position of the measurement spot	

Sample with a curved shape	Visualization of the plane surface for positioning of the spot on this area.	
Transparent sample	Visualization and selection of front reflection.	

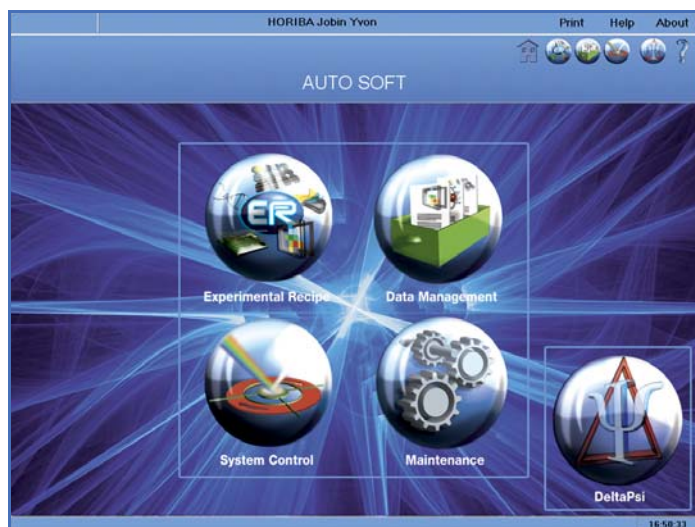
Overview of Auto Soft

The **Auto SE** is controlled by the **Auto Soft** integrated in the Ellipsometric software platform. **It integrates very intuitive interfaces based on the use of icons and internet like hyperlink navigation.** As the software is multi-language it is simple to operate for everyone.

It is also possible to switch to DeltaPsi2 to get access to advanced analysis functions.

Sample analysis are performed in 3 steps :

- 1 - Automated loading and alignment of the sample
- 2 - Launching analysis routine
- 3 - Delivering results via an automatic analysis report



Main interface of Auto Soft

• Model settings for analysis with liquids ?

Application 1: Liquid measurement

The analysis consists in the measurement of the refractive index of a water solution.

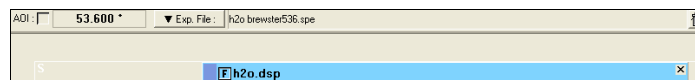
The water is simply contained in a beaker, placed on the sample stage.

Measurement is performed near Brewster angle of water, eg 53.6°.

Model Settings:

Model used for this example is a substrate which represents the bulk water solution and consists in a single transparent Lorentz oscillator.

Dispersion parameters are: $\epsilon_s=1.74$ et $\omega t=11.56$.

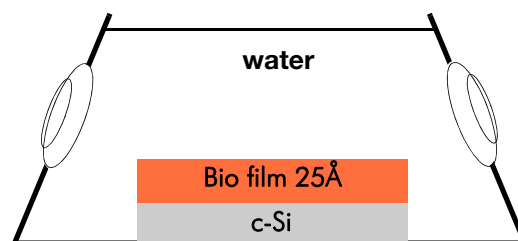


Important Remarks

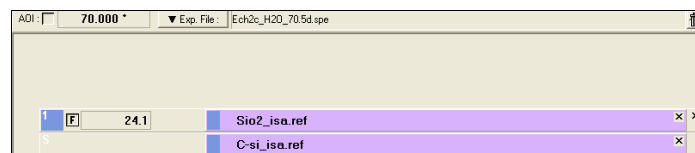
> One should notice that the measurement of a liquid or solid substrate provides directly the (n,k) of the material.

> Fitting the experimental measurement (with the model above) provides more accurate optical constants of the water, and enables to remove the pseudo-k given by the experimental measurement.

Application 2: Solid/Liquid interface measurement



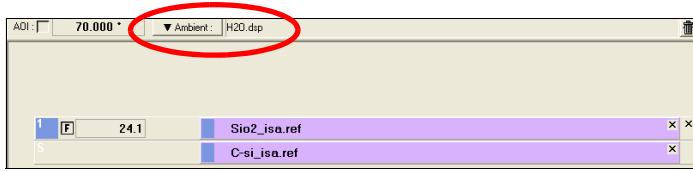
Model Settings:



In the one layer model, a SiO₂ reference material is used to represent the bio layer as it exhibits approximatively the same refractive index.

For this application, the sample is measured in liquid environment, here water.

The setting for measurement environment is done by clicking on the button «Exp file», and selecting «Ambient». Then, just drag the H₂O dispersion or reference file, available in the application library, to the grey bar.

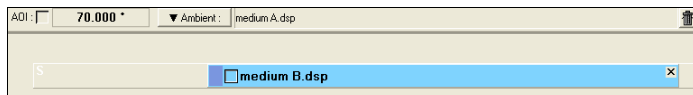
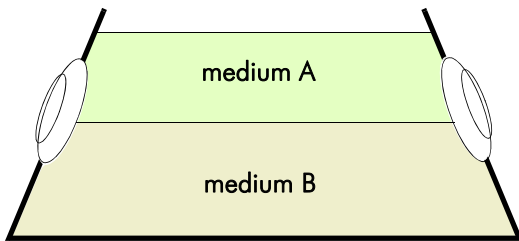


Important Remark

> A liquid cell is needed for this kind of application.

Application 3: Liquid/liquid interface measurement

The interface between liquid A and liquid B was studied.



The model consists of a substrate containing a dispersion file representing the medium B. Click on the button «Exp file» and select «Ambient». The ambient is the medium A.

• **Dispersion formulae for photovoltaics**

Amorphous silicon - Tauc Lorentz

- $E_g = 1.7541800$
- $\epsilon_\infty = 1.6718500$
- $A = 163.7058000$
- $E_0 = 3.6659850$
- $C = 1.6370400$

Depending on material cristallinity: Micro-Silicon - Drude + Tauc Lorentz

- $E_g = 0.9492126$
- $\epsilon_\infty = 1.3967464$
- $\omega_p = 1.2405275$
- $\Gamma_d = 0.0408330$
- $A = 77.9476547$
- $E = 3.5399554$
- $C = 2.0043805$

Drude

Tauc-Lorentz

Micro-Silicon - Tauc Lorentz

- $E_g = 1.4854851$
- $\epsilon_\infty = 2.0829818$
- $A = 117.0201035$
- $E_0 = 3.9960287$
- $C = 1.1446226$

Micro Silicon - Lorentz oscillator + Drude

- $\epsilon_\infty = 3.2485800$
- $\epsilon_s = 10.9838142$
- $\omega_t = 3.1950688$
- $\omega_p = 1.3981062$
- $\Gamma_0 = 1.1426396$
- $\Gamma_d = 0.0356003$

Think also to mix materials inside layer:

c-Si (ref)+ a-Si (dsp)+ void (ref): fit percentages + a-Si dispersion parameters.

SnO₂ – Drude + Tauc Lorentz

- $n_\infty = 1.55116400$
- $E_g = 3.08152200$
- $\omega_p = 1.50795500$
- $\Gamma_d = 0.09719760$
- $A = 42.36777000$
- $E = 6.68421500$
- $C = 2.38262700$

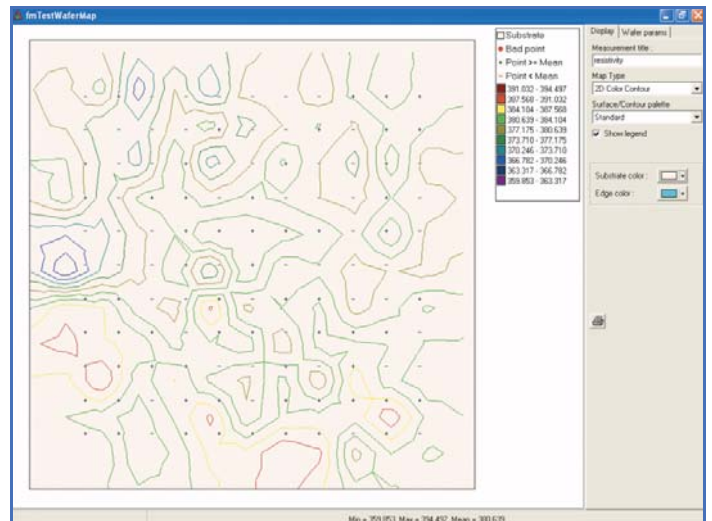
Drude

Tauc-Lorentz

> New in DeltaPsi2!

Calculate film resistivity with Γ_d and ω_p parameters. Resistivity formula is the following :

$$\rho (\mu\Omega.cm) = 10^8 \frac{h\Gamma_D}{2\pi\epsilon_0\omega_p^2}$$



Depending on CdS composition:**CdS – Adachi Forouhi**

$E_0 = 2.72813300$
 $\Delta_0 = -0.47621420$
 $\Gamma = 0.23553900$
 $A_0 = 21.22931000$
 $\varepsilon_\infty = 2.06588100$
 $A_1 = 0.18298750$
 $B_1 = 9.94315300$
 $C_1 = 25.86241000$

CdS – Lorentz Oscillator + Drude

$\varepsilon_\infty = 1.9624980$
 $\varepsilon_S = 6.5976780$
 $\omega_t = 5.4502890$
 $\omega_p = -5.2816030$
 $\Gamma_0 = 5.7807870$
 $\Gamma_d = 1.4003930$

Doped ZnO – New Forouhi + Drude

$E_g = 3.0676916$
 $\varepsilon_\infty = 3.8616166$
 $f_j = 0.9987664$
 $\omega_j = 3.8081589$
 $\Gamma_j = 0.9451496$
 $\omega_p = 1.1629373$
 $\Gamma_d = 0.1347707$

User Club

- **Welcome to !**

The presentation of the club members is done only after their authorization. After the purchase of a HJY ellipsometer, an e-mail is sent asking if they wish to join the club and to be introduced in the next newsletter.

- **Subscribe to the Newsletter !**

The letter is sent two times per year, in July and December.

If you wish to receive it - 2 possibilities:

- Web site: www.jobinyvon.com/EllipsometryNLsubscribe
(soon available)

- Fill out the form below, and send it to:
tfd-marketing@jobinyvon.fr

Name:

Company / Laboratory:

Address:

ZIP:

City:

Country:

E-mail address:

Job Title:

Ellipsometer Type:

UVISEL MM-16 **Auto SE**

In situ UVISEL In situ MM-16

FF-1000 UT-300

Application description: