

High Quality Control of Organic Semiconductor Films by New Generation of Film Measurement Tool

D. Cattelan,

HORIBA Jobin Yvon SAS, ZA de la Vigne aux Loups, 5 avenue Arago, 91380 Chilly-Mazarin, France

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Organic semiconductors developed by state-of-the-art industries are becoming more and more sophisticated while they are deposited in thin films which are thinner and thinner. Common film characterization tool reach their limits to provide accurate control of thin organic semiconductor films.

From the materials development stage to the final thin film device, in the fields of organic light emitting diodes (OLED), organic solar cells, plastic electronics, etc..., spectroscopic ellipsometry is a well-known non-destructive optical technique used for accurate thin film measurement.

Spectroscopic ellipsometry enables the simultaneous determination of film thickness with Angstrom resolution and optical constants (n,k) of single and multi-layer systems. Many additional properties can be determined from the changes they produce on optical constants, including material composition, crystallinity, conductivity, microstructure and more.

The characterization of optical constants is of fundamental interest for the optimisation of the final organic device. Organic semiconductor materials often exhibit very complex optical behaviour with many absorption features that can only be precisely characterized by spectroscopic ellipsometers. Exemples will be given in the field of OLED with the characterization of Cs doped BCP and α -NPD films encapsulated by LiF layer and glass cap respectively. Aging process of α -NPD film was also investigated. The characterization of organic solar cells made of PEDOT:PSS and P3HT will be also reported.

Finally, the technique features rapid measurement capability to control in-line processes. Roll to Roll coaters begin to integrate spectroscopic ellipsometers for the in-line control of thin vacuum deposited films. In-line control of thickness distribution of barrier layers deposited on PET film will be presented.

Keywords: spectroscopic ellipsometry, Thin film measurement, Optical constants, Organic light emitting diodes, Barrier layers, Roll to roll process.