Istituto per la Microelettronica e Microsistemi

IMM

Consiglio Nazionale delle Ricerche

AT2 Technological Area Characterization

WEBINAR: IMM CHARACTERIZATION TOOLS

GIOVEDI' 6 LUGLIO 10:00-12:00

https://meet.goto.com/826213277

ORE 10:00 *INTRODUCTION, Valentina Mussi*

ORE 10:05 *SYSTEMS FOR DYNAMIC STUDY OF STRUCTURAL, OPTICAL, ELECTRICAL PROPERTIES, CHAIR Valentina Mussi*

Sara De Simone, IMM ROMA
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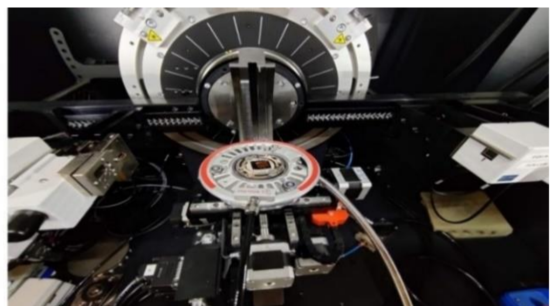
"In-situ characterizations of $Ge_xSb_yTe_z$ based phase change alloys and heterostructures for automotive applications"

In this presentation several analysis techniques used by the PCM group of the CNR-IMM Rome unit will be illustrated. In particular, structural (XRD), chemical-compositional (XRF, FTIR), morphological (SEM, AFM) and electrical (nanopulsed setup, 4 probes) characterization techniques will be shown. In the specific, studies of a dedicated material class, namely the phase-change materials (PCM) will be discussed . In the era of the Internet of Things, ideally any object will be equipped with some memory, computing and communication capability, so as to establish a degree of interconnection which emulates that of natural eco-systems. Among various candidates, the resistive-switching PCM memory technology has been selected as a good candidate for in-memory computing, as it is used in application as storage class memory, mainly due to its scalability, fast writing time and very good endurance properties. The PCM are characterized by the high electrical resistance contrast between their amorphous and crystalline states. Within the National PRIN2020 EMPHASIS, we recently started the synthesis and characterization of PCM layers deposited by RF sputtering to obtain innovative heterostructures capable of performing simultaneously memory and computing operations, in view of artificial intelligence applications. For the future we aim at investigating new PCM combinations that have the potential to be implemented in neuromorphic computing platforms within parallel brain-inspired, neuro-computing architectures.



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ORE 10:30 *IN-HOUSE CUSTOMIZED SYSTEMS, CHAIR Antonietta Taurino*

Adriano Cola, IMM LECCE
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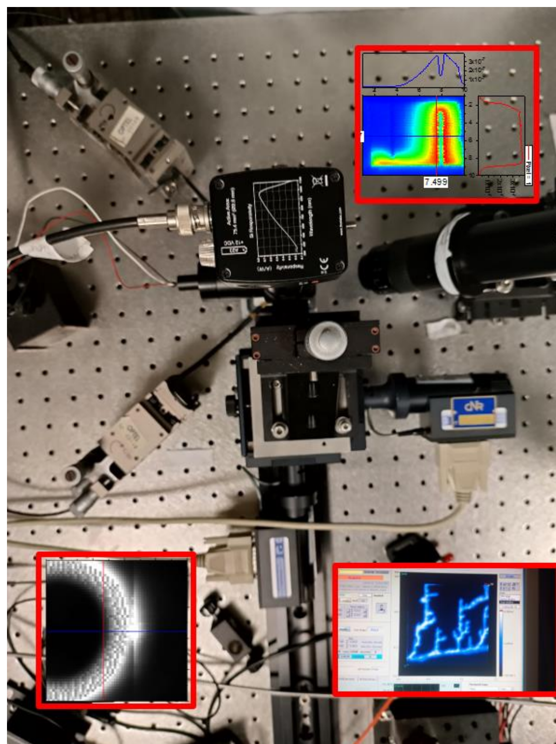
"Photocurrent Mapping Setup as a Versatile Platform"

The spatial distribution of the photocurrent induced by optical spots is of undoubted interest in optoelectronic devices such as photodetectors and solar cells. However, in addition to functional characterization, the photocurrent response has a more general appeal as a local probe: it can be an indicator of the lateral extent of the spatial charge region in planar devices, provide insight into the uniformity of materials or the nature of electrical contacts, to name just a few. Several applications of a micrometer resolution mapping setup will be demonstrated in this webinar. The unique feature of the setup is its extreme flexibility and the fact that it is constantly evolving. It is adapted to specific needs both in terms of optical sources (coherent and non-coherent, wavelengths) and excitation modes (continuous/chopped, focusing through tapered optical fibers, microscope objective, or through a laser system with out-of-focus indicator). In addition to the photocurrent map, it is possible to simultaneously acquire the corresponding total reflection map, the morphology (also in reflection) and, more recently, the photoluminescence map. Finally, I will briefly mention the implementation of photocurrent mapping in a confocal microscope.



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ORE 10:55 *MULTI-TECHNIQUE EQUIPMENTS, CHAIR Alessio Lamperti*

Michele Perego, IMM AGRATE
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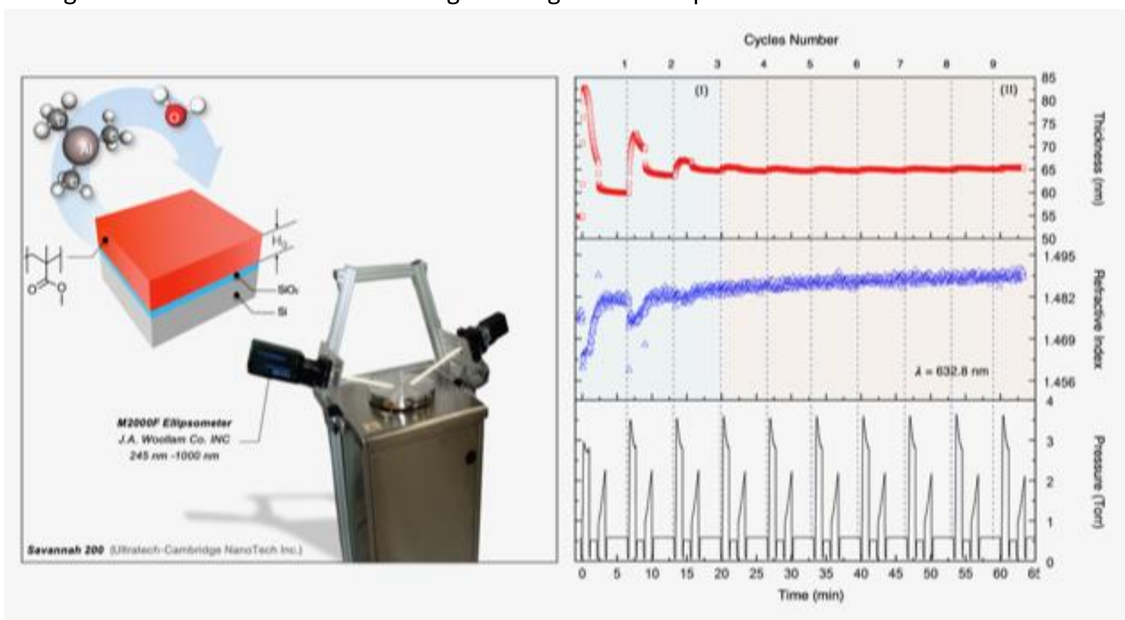
"In-situ Spectroscopic Ellipsometry: a valuable tool to unveil the fundamental mechanism of thin film growth"

Spectroscopic ellipsometry is a non-destructive, non-contact, and non-invasive optical technique which is based on the change in the polarization state of light as it is reflected from a thin film sample. Spectroscopic ellipsometry relies a model based approach to determine interface and surface roughness, thicknesses, as well as optical and electrical properties in thin films with thickness ranging from a few nm to tens of microns. The technique has been employed in several different fields with applications spanning from basic to applied and industrial research. It is a very sensitive technique providing excellent capabilities for thin film metrology and for this reasons it is widely employed in the semiconductor industry for in situ or ex situ monitoring of growth/deposition of organic and inorganic films. In particular by in situ ellipsometry, i.e. real time measurements performed during the processing of a sample, fundamental process parameters, such as growth or etch rates, as well as variation of optical properties with time are determined. In this seminar, we will consider as a case of study the grow of Al2O3 into polymer films by sequential infiltration synthesis. We will show how, by this technique, it is possible to determine fundamental physical parameters providing significant insights about the basic mechanisms governing infiltration process.



ORE 11:20-12:00 *FREE DISCUSSION, QUESTIONS, PROPOSALS, CHAIR Valentina Mussi*

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