Consiglio Nazionale delle Ricerche
Istituto dei Materiali per l'Elettronica ed il Magnetismo

SEMINARIO

Sala A, I° Piano, CNR-IMEM, Parma | 12 dicembre 2023 | ore 11:30

Growth and Raman characterization of selenide and oxide thin-films for photovoltaic and electronic applications

Dr.ssa Giulia Spaggiari

CNR-IMEM, Pama

In this seminar the growth and characterization of three kind of materials, deposited in form of thin-films and studied during my PhD, are presented. The materials are Antimony Selenide (Sb_2Se_3), Gallium Oxide (Ga_2O_3) and Barium Monoferrite ($BaFe_2O_4$), all promising materials for the realization of new devices in the field of photovoltaics and electronics. These materials have been mainly deposited by Low-Temperature Pulsed Electron Deposition (LT-PED) and Radio-Frequency Magnetron Sputtering (RF-MS) techniques. A systematic feed-back information from their characterization was fundamental to tune and define the optimal deposition conditions. Multiple techniques have been used to study the crystalline structure, composition, morphology, optical and electrical properties of deposited thin-films and devices: X-ray diffraction (XRD), Raman spectroscopy, Scanning Electron Microscope (SEM), Energy Dispersive X-Ray Spectroscopy (EDS/EDX), current-voltage measurements in dark and under Solar Simulator illumination, capacitance measurements and admittance spectroscopy. In particular, Raman spectroscopy turned out to be a fundamental complementary tool to finalize the structural characterization provided by XRD measurements and to reach the goal of depositing thin-films with the correct crystallographic phase or properties. Moreover, for the first time a preliminary study is presented on the application of Tip Enhanced Raman Spectroscopy (TERS) in the characterization at the nanoscale of interfaces, that in this case were those between these films and the neighboring layers.

In all the presented cases, the joint materials growth and characterization studies led to improved knowledge on the properties of these promising materials and to an optimization of the deposition process up to obtain good-quality thin-films that can be used for the production of new devices.