



**ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΥΠΡΟΥ
ΤΜΗΜΑ ΦΥΣΙΚΗΣ**

Το Τμήμα Φυσικής του Πανεπιστημίου Κύπρου
σας προσκαλεί την

Τρίτη, 1 Σεπτεμβρίου 2020, ώρα 12:00
στην αίθουσα LRC017, στο κτήριο της Βιβλιοθήκης του Πανεπιστημίου

στην παρουσίαση της Διδακτορικής Διατριβής της Άννας Ζαχαρία

**« Optical Properties of Multinary Chalcogenide Semiconductor Nanostructures
for Light Emission and Light Harvesting Applications »**

Multinary chalcogenide semiconductor (MCS) nanostructures have emerged as attractive functional materials, offering versatility of composition and stoichiometry, low toxicity and attractive optoelectronic properties. In the form of colloidal quantum dots (CQDs), MCS exhibit tunable, size-dependent luminescence in a wide spectral range from visible to near-infrared, with high emission quantum yield when passivated with protective shells making them promising for lighting and bio-imaging applications. Yet the photophysics of MCS nanostructures is complex and not fully understood, being affected by confinement, compositional fluctuations, spatial and energetic disorder and a wide range of defects.

In the presented thesis we study the nature of radiative recombination on two types of ternary MCS quantum dots, namely Zn-shelled CuInS₂ and AgInSe CQDs. The origin of their multicomponent emission is still under debate; we use a systematic approach combining steady-state and transient luminescence and absorption experiment, structural measurements and emission lineshape analysis to probe the nature of the emissive states resolved i.e. point defects, traps, electronic states, using the CQD size as the varying parameter. The thesis is completed by a third project associated with spectroscopy of CuIn_{0.7}Ga_{0.3}Se₂ (CIGS) thin films that are not produced via standard epitaxial methods but instead fabricated via pulsed laser deposition (PLD), a rarely used method in the literature for CIGS. Even less is currently known for the optical properties of PLD-grown CIGS; motivated by this, we carried out a spectroscopic study of PLD-grown CIGS, probing the influence of deposition temperature to unravel the electronic and defect contributions in the films luminescence.

Probing the Origin of Absorbing and Luminescent Species in Silver Indium Selenide Nanocrystals,
A. Zacharia, O. Yarema, P. Papagiorgis, A. Moser, A. Othonos, M. Yarema, V. Wood, G. Itskos,
in preparation, (estimated submission Sept 2020)

Luminescence properties of pulsed laser deposited CuIn_xGa_{1-x}Se₂ films, **A. Zacharia**, C. Nicolaou, J. Giapintzakis, G. Itskos, J. Phys. Commun., 2020, 4, 045001

Single-step growth of high quality CIGS/CdS heterojunctions using Pulsed Laser Deposition, C. Nicolaou, **A. Zacharia**, A. Delimitis, G. Itskos, J. Giapintzakis, Applied Surface Science, 2020, 511, 145547

Influence of Process Parameters on the Properties of Pulsed Laser Deposited CuIn_{0.7}Ga_{0.3}Se₂ Thin Films, C. Nicolaou, **A. Zacharia**, G. Itskos, J. Giapintzakis, Solar Energy, 2018, 174, 793-802