Ηράκλειο 24 Οκτωβρίου 2022

ΠΑΡΟΥΣΙΑΣΗ ΔΙΠΛΩΜΑΤΙΚΗΣ ΕΡΓΑΣΙΑΣ

Της φοιτήτριας Κωνσταντίνας Φάκα, θα γίνει τη

<u>Δευτέρα 31/10/2022</u> και ώρα **10:00**

στην αίθουσα Ε130 του κτηρίου Μαθηματικών και Εφαρμοσμένων Μαθηματικών

Επιβλέποντες: κ. Κωνσταντίνος Στούμπος και κ. Γεράσιμος Αρματάς

Θέμα Διπλωματικής:

«*Volatile Hybrid Organic/Inorganic Copper (I) Iodides/Polyiodides for Efficient*

***Thin-Film Deposition of CuI*»**

Abstract:

P-type inorganic semiconductors are rare and attractive materials, owing to their unique optical and electrical properties. Though other conventional and already studied materials, such as organic p-type Spiro-OMeTAD or polymeric PTAA are well established in the field, it is necessary to explore alternative materials for upgraded performance and reduced cost. An attractive family of materials that combines these features is Cu(I) compounds. In particular, halides and pseudohalides stand out, having been repeatedly employed as viable replacements to the forenamed substances, commonly employed in photovoltaics. One of the most notable difficulties encountered in the use Cu(I) based compounds, is their notorious insolubility in common solvents, thus making its solution processability limited. In this thesis, we propose a viable process of preparing ternary Cu(I) compounds that can subsequently be used for preparing precursor solutions that can act as an efficient deposition method of CuI via standard spin coating and thermal decomposition techniques. Towards this end, we have synthesized and structurally characterized a series of novel hybrid organic/inorganic Cu (I) iodides and polyiodides with diammonium cations, $(H_3N\text{-}(CH_2)_xNH_3)^{2+}$, with general formulae $A_xCuI(I)_y(In)_z$. Because of the high organic carbon content and the presence of the highly polarizable polyiodide species, the compounds exhibit superior solubility in common solvents, thus facilitating the spin casting process, and, importantly, they undergo facile thermal decomposition at relatively low temperatures upon liberation of elemental iodine. The thermal decomposition of selected materials as

well as their solubility tests in common organic solvents have been performed and the first experiment on spincoating have been performed. Ongoing work addresses the suitability of the materials as precursors in the CuI solution deposition process and evaluates their applicability in perovskite solar cells.