

Development of Bismuth Chalcogenide Thin-Film Disruptive Green Solar Technology for Next Generation Photovoltaics

Summary

The PhD student will engage in multidisciplinary scientific activity in the framework of the projects PSG689 and PRG627 on the development and characterization of thin films and solar cell devices based on emerging Bismuth-Antimony chalcogenides (Bi₂S₃, Sb(S,Se)₃, and their alloys) PV absorber materials. Supervisor: Nicolae Spalatu. Co-supervisor: Ilona Oja Acik

Research field:	Chemical, materials and energy technology
Supervisors:	Prof. Dr. Ilona Oja Acik Dr. Nicolae Spalatu
Availability:	This position is available.
Offered by:	School of Engineering Department of Materials and Environmental Technology
Application deadline:	Applications are accepted between May 03, 2021 00:00 and May 31, 2021 23:59 (Europe/Zurich)

Description

The objective of this PhD project is to develop and optimize non-toxic and earth-abundant Bi-chalcogenide absorber material for efficient thin film solar cells by using cost-effective and mass production close-spaced sublimation (CSS) technique. The PhD student will be involved in all the solar cells processing stages. This will include the fabrication of absorber layers by physical techniques such as CSS and vacuum thermal evaporation (VTE) on different substrates: glass, glass/TCOs, glass/Mo, glass/TCOs/window layer. Various CSS deposition parameters (substrate and source temperature, growth pressure) and post-deposition treatments (in tube-furnaces, hot-plates) will be optimized for obtaining single-phase, high-crystallinity, dense, and homogeneous absorber layers with suitable optoelectronic properties and proper thicknesses for thin film solar cell applications. The PhD student will also fabricate different window layers such as CdS, by CSS and chemical bath deposition methods (CBD), and TiO₂ by chemical spray pyrolysis (CSP) and will identify the optimal window/buffer partner in solar cells. The student will prepare the photovoltaic solar cells based on these materials, define the ad hoc selective contacts for efficient charge extraction and characterize the materials properties and solar cells output parameters.

The proposed research project will help the student to acquire a vast range of competencies and skills in developing and designing thin film solar cells, strengthen the researcher's ability to publish in international journals, as well as broaden the network of international contacts with companies and other research groups in the PV field from EU and the world at large through participation in different international conferences.

Supervisor: Nicolae Spalatu
Co-supervisor: Ilona Oja Acik

Applicants should fulfil the following requirements:

- Bachelor's and Master's degree in Physics, Chemistry, Electronic Engineering, Materials Engineering, or a related field
- Demonstrable previous research experience in thin film chalcogenide solar cell technologies
- Knowledge of the use of different physical and chemical deposition techniques (CSS, VTE, sputtering, CBD, CSP), processing equipment (PDTs, furnaces) and characterization tools (XRD, SEM, Van-der-Pauw, solar simulator, spectral response)
- Excellent communication skills in English (both written and verbal)



- Competencies in using data analysis & graphing software: MS Office (Word, Excel, and PowerPoint), Origin



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