



Spring Meeting 2021

May 31- June 4 | Virtual Conference

Symposia & program

Energy materials

A Thin film chalcogenide photovoltaic materials
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B Advances in thermophotovoltaics: materials, devices and systems
[View more info & Program](#)

C Doping and charge transport processes in organic and hybrid materials for energy applications
[View more info & Program](#)

D Organic semiconductors for energy and electronics: from fundamental properties to devices
[View more info & Program](#)

E Exotic materials and innovative concepts for photovoltaics
[View more info & Program](#)

F 2D materials for energy applications
[View more info & Program](#)

G Solid state ionics: advanced concepts and devices
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Energy materials

E

Exotic materials and innovative concepts for photovoltaics

INFORMATION

PROGRAM

The success story of hybrid perovskite solar cells confirms that research on novel photovoltaic materials can produce outstanding breakthroughs. This clearly strongly supports the organization of an E-MRS symposium on novel and emerging materials and concepts for photovoltaics which will serve to make E-MRS a leader in the world in new energy materials.

Scope:

This symposium will address fundamental and applied research on innovative photovoltaics materials and device integration. The focus will be on non-conventional photovoltaics, or conventional photovoltaics but with a radically new approach. Novel materials such as exotic silicon, oxides or multinary compounds, novel organic/inorganic materials will be included. It should be noted that inorganic perovskites have reached a conversion efficiency of 14.3% in 2020 (CsPbI₃). All third generation and emerging concepts such as multiple carrier generation, hot carrier and intermediate band solar cells, upconversion and downconversion are of increasing relevance and will be discussed. Novel experimental synthesis and characterization techniques are of interest in this symposium. Novel contacting and packaging approaches are also of interest. Theoretical calculations of novel materials or emerging concepts are also relevant. Theoretical approaches on novel absorbers and concepts are fundamental to give directions to experimentalists in the field of photovoltaics.

Hot topics to be covered by the symposium:

- Emerging solar cell absorbers
- Computational design of novel materials or concepts
- Novel solar cell devices
- Oxide solar cells
- Bulk photovoltaics and photogalvanic effects
- Organic and hybrid solar cells
- Exotic forms of silicon
- Downshifting, downconversion, upconversion
- Multiple carrier generation
- Intermediate band solar cells
- Hot carrier solar cells
- Transparent conductive oxides
- Innovative characterization techniques
- New contacting and packaging approaches
- New module approaches

Energy materials

E

Exotic materials and innovative concepts for photovoltaics

INFORMATION

PROGRAM

May 31, 2021

Jun 01, 2021

Jun 02, 2021

Jun 03, 2021

START AT

SUBJECT

View All ^

NUM.

16:00

Optoelectronic Study of Perovskites/SnO₂ based Metal-Insulator-Semiconductor Structures



E.P1.22

Authors : J. M. V. Cunha, M. A. Barreiros, M. A. Curado, T. S. Lopes, K. Oliveira, A. J. N. Oliveira, J. R. S. Barbosa, C. Vinhais, D. Flandre, J. P. Teixeira, A. G. Silva, P. A. Fernandes and P. M. P. Salomé
 Affiliations : J. M. V. Cunha^{1,2,3}; M. A. Barreiros⁴; M. A. Curado^{1,5}; T. S. Lopes^{1,6,7,8}; K. Oliveira¹; A. J. N. Oliveira^{1,2}; J. R. S. Barbosa¹; C. Vinhais^{1,9}; D. Flandre¹⁰; J. P. Teixeira¹; A. G. Silva¹¹; P. A. Fernandes^{1,3,12}; and P. M. P. Salomé^{1,2,12} (1) INL – International Iberian Nanotechnology Laboratory, Avenida Mestre José Veiga, 4715-330, Braga, Portugal. (2) Departamento de Física, Universidade de Aveiro, Campus Universitário de Santiago, 3810-193, Aveiro, Portugal. (3) i3N, Universidade de Aveiro, Campus Universitário de Santiago, 3810-193, Aveiro, Portugal. (4) Laboratório Nacional de Energia e Geologia, LNEG/UME (Unidade de Materiais para a Energia), Estrada do Paço do Lumiar, 22, 1649-038 Lisboa, Portugal. (5) CFisUC, Department of Physics, University of Coimbra, P-3004-516, Coimbra, Portugal. (6) Institute for Material Research (IMO), Hasselt University (partner in Solliance), Agoralaanbouw H, Diepenbeek, 3590, Belgium. (7) Imec division IMOMEC (partner in Solliance), Wetenschapspark 1, 3590 Diepenbeek, Belgium. (8) EnergyVille, Thorpark, Poort Genk 8310 & 8320, 3600, Belgium. (9) Departamento de Física, Instituto Superior de Engenharia do Porto, Instituto Politécnico do Porto, Porto 4200-072, Portugal. (10) UCLouvain, ICTEAM institute, Place du Levant 3, 1348 Louvain-la-Neuve, Belgium. (11) CEFITEC, Departamento de Física, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, Campus de Caparica, 2829-516, Portugal. (12) CIETI, Departamento de Física, Instituto Superior de Engenharia do Porto, Instituto Politécnico do Porto, Porto 4200-072, Portugal.

Resume : Tin Oxide (SnO₂) films have been used as an electron transport layer (ETL) in formamidinium-cesium mixed-cation lead mixed-halide perovskites (FA_{0.83}Cs_{0.17}PbI_(3-x)Br_x). This perovskite material has a bandgap of 1.74 eV. To better understand the sputtered SnO₂/perovskite interface, Metal-Insulator-Semiconductor (MIS) devices were fabricated. The MIS stack consisted of gold (Au)/fluorine doped tin oxide (FTO)/SnO₂/Perovskite/Au. In this work, MIS devices were produced with SnO₂ deposited with: i) different thicknesses, in order to study its effects on the electronic properties of the fabricated devices; and ii) with and without annealing, to comprehend the effects of a heat treatment on the SnO₂ optoelectronic and structural properties. Capacitance-voltage-frequency (C-V-f) and capacitance-conductance-frequency (C-G-f) measurements were carried out on the MIS structures, which allowed for: i) the estimation of the apparent number and polarity of fixed insulator charges (Q_f) and ii) the estimation of the density of interface defects (D_{it}), respectively. Moreover, the C-G-f data was used to fit several circuit models and study the MIS AC electrical behaviour. The thickness and annealing were found to influence the extracted Q_f values. The results suggest that the optimum SnO₂ thickness to be used is 20 nm without annealing, in order to maximize Q_f values. On the other hand, D_{it} values appear to be independent of thickness and/or annealing, as their values remained closed for all devices, within error calculation. The AC electrical circuit fitting also show differences between non-annealed and annealed SnO₂ layers on MIS devices. This study was complemented with X-ray photoelectron spectroscopy (XPS) measurements, which allowed to correlate the differences observed on SnO₂ electrical properties before and after annealing with the chemical state of the oxide.