

PERSONAL
INFORMATION

Giulia Lucarelli



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Sex Female | Date of birth 05/08/1989 | Nationality Italian

EDUCATION AND TRAINING

06/06/2020 -
present

Post-doctoral researcher

University of Rome Tor Vergata – Dept. Electronic Engineering, CHOSE (Center for Hybrid and Organic Solar Energy)

- Optimization of materials and deposition processes for highly efficient flexible perovskite solar cells within the H2020 funded APOLO project (SmArt Designed Full Printed Flexible RObust Efficient Organic HaLide PerOvskite solar cells)

01/11/2016 -
05/06/2020

PhD in Electronic Engineering

University of Rome Tor Vergata – Dept. Electronic Engineering, CHOSE (Center for Hybrid and Organic Solar Energy)

- Optimization of materials and deposition processes for new generation photovoltaics
- Fabrication of perovskite solar cells on flexible and elastic substrates
- Optimization of rigid and flexible perovskite solar cells for indoor applications
- Up-scaling of flexible perovskite solar cells

Achievements

- Demonstration of record indoor efficiency for flexible perovskite solar cell on roll-to-roll ITO coated flexible glass (20.6% and 22.6% efficiency under 200 and 400 lx LED illumination)
- Study and development of a protocol for indoor testing
- Optimization of rigid perovskite cells for indoor applications based on SnO₂/MgO bilayers (up to 27% efficiency at 400 lx under LED lighting)
- Development of highly bendable dielectric/metal/dielectric electrodes on flexible plastic, rigid glass and other unconventional substrates (cellulose, elastomers)
- Optimization of electron transporting layers for highly efficient flexible perovskite cells

01/06/2016 -
01/07/2016

Internship at Siemens

Siemens AG, Erlangen, Germany

- Optimization of encapsulation materials and methods for organic photodetectors for NIR applications

07/09/2015 -
07/03/2017

Marie Curie Trainee - Early Stage Researcher

University College London – London Centre for Nanotechnology, UK

Early stage researcher position within the MC-ITN FP7 funded project OSNIRO (Organic Semiconductors for Near InfraRed Optoelectronics), for the optimization and characterization of organic photodetectors and image sensors for NIR applications.

Achievements

- Optimization of newly synthesized and commercial low band gap polymers and small molecules in inverted and conventional photodetectors
- Optimization of the deposition techniques of blocking layers and interlayer for NIR photodetectors

15/10/2012 -
26/05/2015

MSc Materials Science and Technology (grade 110/110 cum laude)

University of Rome Tor Vergata – Science Department

- Focus on: nanomaterials, ceramics, polymers, composites, semiconductors and superconductors, metals and alloys, biomaterials, organic materials for optoelectronics, solid state physics- theory and molecular models
- Expertise acquired in perovskite solar cells, indoor photovoltaics, luminescent solar concentrators
- *Master thesis*: Development of titanium dioxide compact and mesoporous layers for flexible perovskite solar cells.

Achievements

- Demonstration of the first flexible perovskite solar cell tested under indoor LED illumination
- Investigation of the effect of blocking layers on the performance of indoor perovskite solar cells
- Study of electrochemical methods for the quantifying the concentration of pinholes in compact electron transporting layers

05/02/2011 -
05/09/2011

L.L.P. Erasmus Scholarship

University of Zaragoza, Spain

15/10/2008 -
03/05/2012

BSc Industrial Chemistry (grade 103/110)

University of Rome La Sapienza– Science Department

- Focus on: inorganic and organic chemistry, physics, physical and analytical chemistry, polymer science, industrial chemical processes, mathematics and statistics, biochemistry, electrochemistry.
- Advanced knowledge and laboratory experience in chemistry and chemistry-related subjects
- *Thesis*: Optical and electrochemical study of the adsorption of squaraine dyes on dye sensitized solar cells photo-anodes.

Achievements

- Electrodeposition of highly compact ZnO electron transporting layers for dye-sensitized solar cells

10/09/2003 -
10/07/2008

High School Diploma - Classical Studies (grade 100/100)

Orazio High School - Rome

PERSONAL SKILLS

Job-related skills

- Experienced in working with glove box
- Experienced in working in cleanroom
- Experienced in working with chemicals
- Printing and deposition techniques: spin coating, doctor blading, electrodeposition, electrophoretic deposition, thermal evaporation, manual spray-coating.
- Basics of laser patterning (CO₂ and UV laser)
- Characterization techniques: electrical and electrochemical characterization techniques, optical and confocal microscopy, UV-Vis spectroscopy, profilometer, four-point probe, electrical characterization of solar cells and photodetectors, atomic force microscopy (AFM) and basics of scanning electron microscopy (SEM) and other standard techniques.
- Experienced in materials formulation for new generation photovoltaics, e.g. metal oxides, polymeric semiconductors, small molecules, organic-inorganic hybrid halides, metallic ultra-thin films and nanowires

- Experienced in supervision and tutoring of master and visiting PhD students

Computer skills

- Good command of Microsoft Office™ tools, especially Word, Excel and PowerPoint
- Good command of iWork tools, such as Pages, Numbers and Keynote
- Good command of OriginLab software for data analysis and plotting
- Good command of LabView (Core1 and Core2)

ADDITIONAL INFORMATION

- Attendance to the course “Evaluation in H2020 projects: criteria, process and role of the examiner” – 23/05/19, Rome
- Attendance to LabVIEW Core 1 course, 21-23/01/19, Roma
- Attendance to LabVIEW Core 2 course, 24-25/01/19, Roma
- Winner of the scholarship “F. P. Califano” of “Fondazione Roma Sapienza” to fund the project “Flexible and stretchable perovskite solar cells” – 2018-2019
- Attendance to the courses “Scientific Writing”, “Project Management”, “Intellectual Properties” at University of Rome Tor Vergata, 02-03/2018

List of publications

- S. Castro-Hermosa*, G. Lucarelli*, M. Top, M. Fahland, J. Fahlteich, T. M. Brown. (2020) Perovskite Photovoltaics on Roll-to-Roll Coated Ultra-Thin Glass as Flexible High-Efficiency Indoor Power-Generators. CELL REPORTS PHYSICAL SCIENCE, doi: 10.1016/j.xcrp.2020.100045
- V. Gupta, G. Lucarelli, S. Castro-Hermosa, T. M. Brown, M. Ottavi. (2020) Characterization & modelling of perovskite-based synaptic memristor device. MICROELECTRONICS RELIABILITY, 111, 113708, DOI: 10.1016/j.microrel.2020.113708
- G. Lucarelli, T. M. Brown. (2019) Development of highly bendable transparent window electrodes based on MoO_x, SnO₂ and Au dielectric/metal/dielectric stacks: application to indium tin oxide (ITO)-free perovskite solar cells. FRONTIERS IN MATERIALS, doi:10.3389/fmats.2019.00310
- F. Brunetti, A. Operamolla, S. Castro-Hermosa, G. Lucarelli, V. Manca, G. Farinola, T. M. Brown. (2019) Printed solar cells and energy storage devices on paper substrates. ADVANCED FUNCTIONAL MATERIALS, 29, 1806798, doi: https://doi.org/10.1002/adfm.201806798
- J. Dagar, S. Castro-Hermosa, G. Lucarelli, A. Zampetti, F. Cacialli, T. M. Brown. (2019) Low-temperature solution processed thin SnO₂/Al₂O₃ double electron transport layers towards 20% efficient perovskite solar cells, IEEE JOURNAL OF PHOTOVOLTAICS, 9, 1309-1315, doi: 10.1109/JPHOTOV.2019.2928466
- J. Dagar, S. Castro-Hermosa, G. Lucarelli, F. Cacialli, T. M. Brown. (2018) Highly efficient perovskite solar cells for light harvesting under indoor illumination via solution processed composite electron transport layers. NANO ENERGY, 49, 290-299, doi: 10.1016/j.nanoen.2018.04.027
- G. Lucarelli, F. Di Giacomo, V. Zardetto, M. Creatore, T. M. Brown. (2017) Efficient light harvesting from flexible perovskite solar cells under indoor white light-emitting diode illumination. NANO RESEARCH, 10, 2130-2145, doi: 10.1007/s12274-016-1402-5
- V. Zardetto, F. Di Giacomo, G. Lucarelli, W. M. M. Kessel, T. M. Brown. (2017) Plasma-assisted atomic layer deposition of TiO₂ compact layers for flexible mesostructured perovskite solar cells. SOLAR ENERGY, 150, 447-453, doi: 10.1016/j.solener.2017.04.028
- F. Di Giacomo, V. Zardetto, G. Lucarelli, L. Cinà, A. Di Carlo, M. Creatore, T. M. Brown. (2016) Mesoporous perovskite solar cells and the role of nanoscale compact layers for remarkable all-round high efficiency under both indoor and outdoor illumination. NANO ENERGY, 30, 460-469, doi: 10.1016/j.nanoen.2016.10.030
- V. Gupta, G. Lucarelli, S. Castro-Hermosa, T. M. Brown, M. Ottavi. (2019) Perovskite based low power synaptic memristor device for neuromorphic application, 14th International Conference on Design & Technology of Integrated Systems In Nanoscale Era (DTIS), 1-6, doi: 10.1109/DTIS.2019.8734983
- F. Di Giacomo, V. Zardetto, A. D'Epifanio, G. Lucarelli, S. Pescetelli, F. Matteocci, S. Razza, A. Di Carlo, W. M. M. Kessels, M. Creatore, T. M. Brown. (2015) Device architectures with nanocrystalline mesoporous scaffolds and thin compact layers for flexible perovskite solar cells and modules. Proceeding for the 15th International Conference on Nanotechnology, 2015 IEEE 15th International Conference on Nanotechnology (IEEE-NANO), p. 739 -742, doi: 10.1109/NANO.2015.7388714
- V. Zardetto, F. Di Giacomo, M. A. Mohammed, G. Lucarelli, S. Razza, A. D'Epifanio, S. Licoccia, W. M. M. Kessel, A. Di Carlo, T. M. Brown. (2015) Opportunities of atomic layer deposition for perovskite solar cells. ECS TRANSACTIONS, 69, p. 15-22, doi: 10.1149/06907.0015ecst