



UNIVERSITÀ DI PARMA

Alessio Bosio

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Curriculum Vitae

- **Short presentation**

Alessio Bosio obtained the degree in Physics at the University of Parma in 1986 with a thesis entitled "Solar Cells Based on CuInSe₂ Thin Films on Low-Cost Substrates". Starting from 1986 he works at the Thin Film Laboratory (ThiFiLab) of the Department of Mathematical, Physics and Computer Sciences of the University of Parma. He is a researcher with more than thirty years' experience in photovoltaic materials and thin film devices technology. In particular he studied polycrystalline thin film solar cells and thin film electroluminescent devices where the active material is ZnS:Mn. Among the most important scientific results is to mention the research on the CuInSe₂/CdS and CdTe/CdS based solar cells with efficiencies more than 16%. One of the highest efficiency/cost ratios never reached with these devices. He also acquired considerable experience on thin film deposition techniques such as:

- a) deposition of semiconductor and ceramic materials by magnetron R.F., D.C. and pulsed D.C. Sputtering.
- b) deposition of compounds by electron beam gun (EBG);
- c) deposition of semiconductors with high crystalline quality used as absorber in photovoltaic devices with the innovative close-spaced-sublimation technique (CSS).

Since 1990 he is part of the Italian National Institute of Matter Physics. He participated in several research projects (Joule) on photovoltaic devices within the Framework Program of the European Community. He participated to numerous international meetings presenting reports and scientific results. He also participated at several international conferences. In more than ten of these he was an invited speaker. He is co-inventor of ten international patents covering the major innovations about the construction of thin film polycrystalline CdTe/CdS and CuInGaSe₂/CdS solar cells. Some of these patents, related to thin film polycrystalline CdTe / CdS photovoltaic modules, are the basis of the technology transfer that led to the creation of a photovoltaic industry, Arendi SpA. Since 2007 he is head of the local Research Unit within the PRIN 2007 project entitled "Celle Solari a Film Sottile di CdTe/CdS su Substrati Flessibili Prodotte Mediante la Tecnica della CSS" Since 2009, he was WP-leader of the Work Package 4 "Thin film solar cell production" in the "Advanced Photovoltaic Lasers for Industrial Processing Enhancement (ALPINE) project within the 7th Framework Program of the European Community. Since 2010 he is the scientific responsible of the C line of the Building Integrated Photovoltaics (BIPV) project of the Industry 2015 Program, entitled: "Piastrine Ceramiche e Lastre di Vetro con Funzionalità Fotovoltaica per la Realizzazione di Involucri Evoluti in Edilizia". Since 2010 he is responsible for "Thin Film Laboratory" (ThiFiLab) of the Department of Mathematical, Physics and Computer Sciences, University of Parma. The scientific activity of Prof. Bosio is attested by the publication of many articles in high-impact international journals (101) and from his participation in international conferences (70) on photovoltaic devices. In some of these he presented an invited talk. He is co-inventor of 8 international patents filed in the most industrially advanced countries and 2 patent applications filed in Italy.

He was the Editor of a book dedicated to thin-film solar cells and was Guest Editor of two special issues in international journals dedicated to second-generation photovoltaics. He is also the co-author of 8 book chapters and a monograph on thin film photovoltaics. From 2013 to 2015 he was a member of the International Advisory Committee of the International Solar Asia Conference on Solar Energy Materials, Solar Cells & Solar Energy Applications. Since 2015 he is part of the Editorial Board of Solar Energy as Associate Editor. Since 2016 he is a member of the scientific committee of Sciences and Research - Italian Book Association.

- **Qualifications:**

Master's degree in physics, specialization in Solid State Physics (1986)

- **Career path:**

- (February 2022 -) **Associate professor**
- (January 2020 -) **National scientific qualification as full professor (Experimental Matter Physics)**
- (June 2000 - February 2022) **Aggregate professor**
- (February 1990 - June 2000) **Graduate technician**
- (April 1986 - February 1990) **Post-degree position**

- **Research Projects**

1. Title of the project: "Ecosystem for Sustainable Transition in Emilia-Romagna" (Ecosister)
Funder: Project funded under the National Recovery and Resilience Plan (NRRP), Mission 4 Component 2 Investment 1.5 - Call for tender No. 3277 of 30/12/2021 of Italian Ministry of University and Research funded by the European Union - NextGenerationEU

Award Number: Project code ECS00000033, Concession Decree No. 1052 of 23/06/2022 adopted by the Italian Ministry of, CUP D93C22000460001, "Ecosystem for Sustainable Transition in Emilia-Romagna". Period: 2021 - 2026 Role: **Head of project**

2. Title of the project: "Elettroluminescenza con termografia automatizzata in impianti fotovoltaici di grandi dimensioni" as part of the call: "Progetti di innovazione e diversificazione di prodotto o servizio per le PMI - 2019". Executive doc. n. 287/2020 of 02/04/2020 - CUP code: E95F19002190007. Period: 2020 - 2021 Role: **Head of project**
3. Title of the project: "*Convention framework between the University of Parma - Department of Mathematical, Physical and Computer Sciences and Solar Systems and Equipment Ltd. (SSE)*". Theme: preparation and study of thin films of innovative semiconductor materials (abundant elements on the earth's crust) to be used in thin-film solar cells with the aim of creating devices with high efficiency (> 16%) and low cost. Period: 2017 – 2020 Role: **Head of Project.**
4. Title of the project: "*Convention framework between the University of Parma - Department of Physics and Earth Sciences and Solar Systems and Equipment Ltd. (SSE)*". Theme: Study of materials for photovoltaics with particular regard to nanostructured semiconductors used as absorbers in solar cells and of innovative substrates such as glass, ceramics, metal foils and polymers for use in photovoltaic devices. Period: 2011 – 2016 Role: **Head of Project.**
5. Title of the project: "*Ceramic Photovoltaic Tile for Sustainable Building - Realization of Thin-film CIGS-based PV Cells*" within the "Industry 2015 - Energy Efficiency" Program. Period: 2010 – 2013. Role: **Head of Project.**
6. Title of the project: "*Development and optimization of a process for the production of thin film solar cells based on CdTe / CdS*". Within University of Parma and Arendi S.p.A. Period: Sept. 2010 – March 2012. Role: **Head of Project.**
7. Title of the project: "*Advanced Lasers for Photovoltaic Industrial processing Enhancement – ALPINE*". Within the FP7 NMP program of the European Community. Theme: "Expanding the limits of advanced materials processing applications through a new generation of high brilliance lasers". Period: 2009 – 2012. Role: **Head of Project.**
8. Title of the project: "*Polycrystalline thin film solar cells: development of scalable technologies for the production of photovoltaic modules*" within the FIRB-Project entitled: "Project Ideas 2006: Photoenergy_RDB". Period: 2007 – 2010. Role: **Head of Project.**
9. Title of the project: "Development and optimization of a process for the production of thin film solar cells based on CdTe / CdS". Within University of Parma and Arendi S.p.A. Period: July 2008 – Jan. 2010. Role: **Scientific Coordinator.**
10. Title of the project: "CdTe / CdS – Based Polycrystalline Thin Film Solar Cells". Executive Scientific Program for the Co-operation Italy/Mexico 2007 - 2009 - Project ENER 1. Period: 2007 – 2009. Role: **Scientific Collaborator.**
11. Title of the project: "CdTe / CdS – based thin film solar cells on flexible substrates produced by the CSS technique". Within the Research Program of National Interest (Prin) of the Italian Ministry of Education University and Research (MIUR) entitled: "CdTe / CdS – based thin film solar cells on flexible substrates produced by the CSS technique". Partners: Period: 2007 – 2009. Role: **Head of Project.**
12. Title of the project: "Technology transfer of a dry process for the production of thin film solar modules based on CdTe / CdS". Within University of Parma and the Ministry for the Environment, Land and Sea. Period: 2006 – 2010. Role: **Scientific Coordinator.**
13. Title of the project: " Development and production of thin film devices (CuInGaSe₂/CdS-based) on flexible substrates ". Within University of Parma and Galileo Avionica-Gruppo Finmeccanica (Leader). This project was funded by Italian Spatial Agency – ASI. Period: March 2007 - Dec. 2007. Role: **Scientific Collaborator.**
14. Title of the project: "CADBACK - The CdTe thin film solar cell - improved back contact". Within the FP4-NNE-JOULE Program. Theme: "Specific programme for research and technological development, including demonstration in the field of non-nuclear energy". Period: Jan. 1998 – Oct. 2001. Role: **Scientific Collaborator.**
15. Title of the project: "ZnS (Mn)-based thin film electroluminescent devices with high emission efficiency". Joined project of the Ministry of Industry and Enirisorse - CERIVE (Research Center – Venice). Period: 1997 – 1999. Role: **Scientific Collaborator.**
16. Title of the project: "*CdTe Thin Film Solar Cell. Study of selected technical aspects*". Within the Third Framework Programme (JOULE 2) of the European Community based on specific research and technological development programme in the field of non-nuclear energy, 1990-1994. Period: Jan 1992 – Nov. 1995. Role: **Scientific Collaborator.**

- **Awards and Acknowledgments:**

The patent "Metodo per la formazione di un back-contact non rettificante in celle solari a film sottile di CdTe/CdS", PCT/IT2007/000469, filed by Solar System and Equipment s.r.l. whose inventors are: N. Romeo, A. Bosio, A. Romeo received an award promoted by the Camera di Commercio Industria Artigianato e Agricoltura of Lucca as the best invention in Italy in the field of renewable energies for the year 2007.

- **Spin-Off (Co-founder and President – 2017-2023)**
Smart Photovoltaic Technology Ltd – SpoT (2017) (<http://www.spot-17.com>)
- **Patents**
nr. 5 (national), nr. 5 (international)
- **Invited talk**
nr. 10 (national), nr 11 (international)

- **Teaching activity**

- **Degree: Material Science** (from 2021)

- Course: Introduction to Material Science

- Institutional activity: Deputy Dean of the Material Science Graduate Program Council

- Reference Teacher of the degree in Materials Science

- Member of the Council of the PhD Program in Materials Science

- **Degree: Physics** (from 2014)

- Course: Physical Technology for Renewable Energies

- Contact Person of the Department for Outgoing Orientation

- Advisor of 5 PhD students and of more than 50 bachelor and master thesis projects.

- **Citation Report (13-06-2023)**

- Scopus: 101 documents, 2032 citations, h-index 24

- Google Scholar: 147 documents, 2970 citations, h-index 29

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