Alessio Bosio
University of Parma
Department of Physics and Earth Sciences
G.P. Usberti 7/A
43124 PARMA - ITALY

ph +39 0521 905257
fax+39 0521 905223
e-mail: alessio.bosio@unipr.it

Curriculum Vitae

Personal Data:
Degree in physics
Italian nationality
Born on the 28th May 1959

Short presentation

Alessio Bosio obtained the degree in Physics at the University of Parma in 1986 with a thesis entitled "Solar Cells Based on $CuInSe_2$ Thin Films on Low Cost Substrates" with thesis supervisor Professor Nicola Romeo. Starting from 1986 he works at the Thin Film Laboratory (ThiFiLab) of the Department of Physics and Earth Sciences of the University of Parma. Alessio Bosio is a researcher with more than twenty-five 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 $CuInSe_2$/CdS and CdTe/CdS based solar cells with efficiencies in excess of 16%. One of the highest efficiency/cost ratio 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 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 nine international patents covering the major innovations about the construction of thin film polycrystalline CdTe/CdS and $CuInGaSe_2$/CdS solar cells. Some of these patents are the basis of the technology transfer that led to the creation of a photovoltaic industry, Arendi SpA, which uses the thin film polycrystalline CdTe / CdS technology. This industry, unique in Italy, will produce 18 MW per year of solar modules. Since 2007 he is head of the local Research Unit within the PRIN 2007 project entitled " Celle Solari a Film Sottili di CdTe/CdS su Substrati Flessibili Prodotte Mediante la Tecnica della CSS" Since 2009, he is 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: "Piastrelle Ceramiche e Lastre di Vetro con Funzionalità Fotovoltaica per la Realizzazione di Involucri Evoluti in Edilizia". Since 2010 he is responsible for "ThinFilmLaboratory" (ThiFiLab) of the Department of Physics, University of Parma. The scientific activity of prof. Bosio is evidenced by the publication of more than 45 articles in international journals, 5 chapters and 1 book on PV materials and devices, and by the participation in approximately 50 international conferences on PVs.

Qualifications:

Master Degree in Physics, specialization in Solid State Physics (1986)
Department of Physics, Faculty of Science, University of Parma, Italy

Thesis Title: “Solar Cells Based on CuInSe2 Thin Films on Low Cost Substrates”

Career path:

• (June 2000 –) **Aggregate professor**
Department of Physics and Earth Sciences, University of Parma
• (February 1990 – June 2000) **Graduate technician**
Thin Film Laboratory (ThiFiLab), University of Parma
• (April 1986 – February 1990) **Post-degree position**
Research project on “High efficiency $CuInGaSe_2$/ CdS” solar cells made by sputtering”.
Thin Film Laboratory (ThiFiLab), University of Parma

Research Activity

• Patents:

1. **A. Bosio**, N. Romeo, D. Menossi, (2015), "*Processo per la produzione di celle solari a film sottili a base di $Cu_2ZnSn(S,Se)_4$*". Patent application nr. PR2015A000017, University of Parma, (UNIPR)
2. N. Romeo, **A. Bosio**, A. Romeo (2012). "*Processo per la Produzione di Celle Solari a Film Sottili"*. Patent application nr. FI2012A000090, ADVANCED RESEARCH ON PV-TECH s.r.l. (ARESP).
3. N. Romeo, **A. Bosio**, A. Romeo (2011). "*Metodo per l'Attivazione di film sottili di CdTe per l'applicazione in celle solari a film sottile di tipo CdTe/CdS*" PCT/IB2010/054587. "*Method for the Activation of CdTe Thin Films for the Application in CdTe/CdS Type Thin Film Solar Cells"*. WO/2011/045728, ARENDI S.p.A. Active Patent *
4. N. Romeo, **A. Bosio**, A. Romeo (2009). "*Processo per la Produzione di Celle Solari a Film Sottili Cu(In,Ga)Se_2/CdS"*. Patent application nr. FI2009A000200, ADVANCED RESEARCH ON PV-TECH s.r.l. (ARESP).
5. N. Romeo, **A. Bosio**, A. Romeo (2007). "*Metodo per la formazione di un back-contact non rettificante in celle solari a film sottile di CdTe/CdS*" PCT/IT2007/000469. *"Method for the Formation of a Non-Rectifying Back-Contact in a CdTe/CdS Thin Film Solar Cell"*. WO/2009/001389, ARENDI S.P.A. Active Patent *
6. N. Romeo, **A. Bosio**, A. Romeo (2006). *"Un processo per la produzione su larga scala di celle solari a film sottile di CdTe/CdS, senza l'uso di $CdCl_2$"* PCT/IT2006/000053. *"A Process for Large-Scale Production of CdTe/CdS Thin Film Solar Cells, Without the Use of $CdCl_2$"*. WO2006085348, ARENDI S.P.A. Active Patent *
7. N. Romeo, **A. Bosio**, A. Romeo (2002). "*Processo per la Produzione su Larga Scala di Celle Solari a Film Sottili CdTe/CdS"*. PCT/IT02/00634, "*A Process for Large-Scale Production of CdTe/CdS Thin Film Solar Cells*" WO/2003/032406, Solar Systems & Equipment S.r.l. Active Patent *
8. N. Romeo, **A. Bosio**, A. Romeo (2001). "*Processo Adatto alla Fabbricazione di Celle Solari a Film Sottili a Base di Cu(In,Ga)Se_2/CdS su Larghe Aree"*. Patent application nr. LU2001A000009, Patent nr. 0001330046, Solar Systems & Equipment S.r.l.
9. N. Romeo, **A. Bosio**, A. Romeo (2001). "*Sorgente per Depositare Film Sottili di CdTe e CdS Mediante CSS (Close-Spaced-Sublimation)"*. Patent application nr. LU2001A000011, Patent nr. 0001330047, Solar Systems & Equipment S.r.l.
10. N. Romeo, **A. Bosio**, A. Romeo (2001). "*Preparazione di un Ossido Trasparente e Conduttore (TCO) Adatto alla Produzione su Larga Scala di Celle Solari a Film Sottili Tipo CdTe/CdS*". Patent application nr. LU2001A000012, Patent nr. 0001330048, Solar Systems & Equipment S.r.l.

*The active patents have been filed in the following countries:
AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW. African Regional Intellectual Property Org. (ARIPO) (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW) Eurasian Patent Organization (EAPO) (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM) European Patent Office (EPO) (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR) African Intellectual Property Organization (OAPI) (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

• Research Projects

1. 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.**
2. 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. Partners: Panariagroup Industrie Ceramiche S.p.A. (Leader), Sacmi Group, PEMCO Euroinks, ICIE, Centro Ceramico – Bologna, Elettronica Santerno, Solar Systems & Equipment srl, Università di Parma, Università di Verona, Elettrorava s.p.a, Dallera s.r.l. Period: 2010 – 2013. Role: **Head of Project.**
3. 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. - Lonate Pozzolo (Va) - Italy. Period: Sept. 2010 – March 2012. Role: **Head of Project.**
4. 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". Partners: University of Parma-Department of Information, Computer Engineering and Telecommunications (Leader), JRC -Joint Research Centre- European Commission, Quanta System S.p.A., Oclaro Switzerland Ag., Univerza v Ljubljani, Elettrosystem. s.a.s., Nexcis, Zentrum fuer Sonnenenergie- und Wasserstoff-forschung, Baden-Wuertemberg (ZSW), University of Verona, Nkt Photonics a/s, Eolite Systems sa, Wurth sSolar GmbH & Co, Solar Systems & Equipment s.r.l., Multitel asbl, Lpkf Laser & Electronics ag. Period: 2009 – 2012. Role: **Head of Project.**
5. 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". Project theme: "Exploratory actions useful to define a national platform for the development of photovoltaic materials and devices for the thecnological transfer to the industry, in order to create a new class of innovative modules for the reduction of energy use in buildings and for the dissemination of the micro distributed generation". Partners: ENEA (Leader), Eni Tecnologie SpA , CESI, CRIS – Consorzio Ricerche Innovative per il Sud, Edison SpA, Angelantoni Industrie SpA, INFN - University of Ferrara, University of

Bologna, University of Napoli, University of Parma, University of Milano, ENI - Venezia Tecnologie, Baccini Srl, TecnoFimes Srl, Enerpoint, University of Firenze. Period: 2007 – 2010. 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. - Lonate Pozzolo (Va)- Italy. Period: July 2008 – Jan. 2010. Role: **Scientific Coordinator.**
7. 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**.
8. 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: Massimo Mazzer – IMEM CNR – Parma, Alessandro Romeo – National Coordinator – University of Verona. Period: 2007 – 2009. Role: **Head of Project.**
9. 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.**
10. 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.**
11. 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". Partners: ANTEC - Angewandte Neue Technologien GmbH (Leader), Eidgenössische Technische Hochschule - ETH Zürich, University of Durham, Universiteit Gent, Institut fuer Solarenergieforschung GmbH; Hameln/Emmerthal, Solaronix SA, University of Parma, Commission of the European Communities. Period: Jan. 1998 – Oct. 2001. Role: **Scientific Collaborator.**
12. Title of the project: *"* ZnS (Mn)tbased 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.**
13. 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. Partners: ANTEC - Angewandte Neue Technologien GmbH, University of Durham, Università degli Studi di Parma, University of Bath, Gesellschaft zur Förderung der Industrieorientierten Forschung an der Schweizerischen ETH, University of Northumbria at Newcastle, Centre National de la Recherche Scientifique, Universiteit Gent, BP SOLAR Ltd, Microchemistry Ltd. 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.

Scientific and technological know-how:

- Thin films deposition technologies: ultra-high vacuum thermal evaporation, thermal evaporation in a controlled atmosphere, electron-beam evaporation, DC Magnetron Sputtering and RF Reactive Sputtering, II-VI compounds Close-Spaced Sublimation
- Characterization of physical and electro-optical properties of metals, semiconductors and insulators: X-ray spectroscopy (XRD), Scanning Electron Microscopy (SEM), Energy dispersive X-ray analysis (EDX), atomic force microscopy (AFM), fluorescence spectroscopy, cathode-luminescence spectroscopy, photoluminescence spectroscopy, uv-vis-nir spectroscopy.
- Devices electrical characterization: I-V characteristics, C-V characteristics, EBIC, LBIC, Hall Effect, Quantum Efficiency.
- Experience in technology transfer projects (design and realization) from laboratory scale to photovoltaic modules industrial production.

Spin off

1. **Solar Systems and Equipment Ltd – SSE**. In the year 2000 Prof. Alessio Bosio with other 5 partners founded the company "Solar Systems and Equipment s.r.l." with the aim to transfer the CdTe/CdS based solar cells technology from laboratory to an industrial level. This company was very active in the CdTe R&D having deposited several patents concerning the production process of this kind of photovoltaic modules. In 2006 it was realized a joint venture with other parties to form a new company, "Arendi S.p.A.", whose task is to realize and sell this new generation of photovoltaic modules.
2. **Advanced Research on Photovoltaic Technology Ltd – ARESP.** With the contribution of Prof. Alessio Bosio, in 2009 it was founded a new company, "Advanced Research On Pv-Tech s.r.l.". The objective of this company is to scale up the solar cell technology based on Cu(In,Ga)Se2 from laboratory to industry. Concerning this objective it has been filed a patent application that greatly simplifies the manufacture technology of the CIGS-based PV modules. Prof. Alessio Bosio is one of the co-inventors of this patent. During this period, Aresp is contributing to the development of a research project within the "Industria 2015" program aimed to creating solar tiles using CIGS technology. This project is especially useful for developing the buildings integration of photovoltaic (BIPV). The company is looking for partners to develop the business plan.

Consulting activity:

- (2014 – 2015): Expert evaluator and rapporteur for the M-ERA-NET Joint Call-2014.
- (2000 –) : Solar System and Equipment Ltd. (SSE) consultant concerning the technological transfer projects for the production of photovoltaic modules based on CdTe/CdS and the design and engineering of the production process.
- (2006 – 2012) : Arendi S.p.A. consultant with the task of giving its technological and scientific contribution to the solution of problems related to the production process of the PV modules directly on the production line .
- (2010 – 2012): Expert evaluator for the measure " Centri di Innovazione " of the Piemonte Region, for both the presentation of R&D projects by private entities and for the scientific and administrative reports of the same projects.
- (2009 –): Advanced Research on PV Tech Ltd (Aresp) consultant for technology transfer projects regarding the production of photovoltaic modules based on Cu(In, Ga)Se2/CdS.

International collaborations:

ANTEC Solar - Angewandte Neue Technologien GmbH (Germany), University of Durham (UK), University of Bath (UK), Gesellschaft zur Förderung der Industrieorientierten Forschung an der Schweizerischen ETH (Switzerland), University of Northumbria at Newcastle (UK), Centre National de la Recherche Scientifique (Fr), Universiteit Gent (Be), BP SOLAR Ltd (UK), Microchemistry Ltd (Finland), Institut fuer Solarenergieforschung GmbH; Hahn-Meitner-Institut (HMI) (Germany), Solaronix SA (Switzerland), JRC joint research centre - Commission of the European Communities, CINVESTAV – Merida – Yucatan (Mexico), Oclaro Switzerland Ag. (IT), Univerza v Ljubljani (Slovenja), Nexcis (Fr), Zentrum fuer Sonnenenergie- und Wasserstoff-forschung, Baden-Wuertemberg (ZSW) (Germany), Nkt Photonics a/s (Denmark), Eolite Systems sa (Fr), Wurth Solar GmbH & Co (Germany), Multitel asbl (Be), Lpkf Laser & Electronics ag. (Germany), Hallam Sheffield University.

National collaborations:

Enirisorse - Centro Ricerche Venezia (CERIVE) (IT), Arendi Corp. (IT), Advanced Research On Pv-Tech Ltd (ARESP – IT), Solar Systems and Equipment Ltd (SSE – IT), Galileo Avionica-Gruppo Finmeccanica (IT), Università di Verona (IT), IMEM – CNR – Parma (IT), ENEA (IT), Eni Tecnologie SpA (IT), CESI (IT), CRIS – Consorzio Ricerche Innovative per il Sud (IT), Edison Corp. (IT), Angelantoni Industrie Corp. (IT), INFN - Università di Ferrara (IT), Università di Bologna (IT), Università di Napoli Federico II (IT), Università di Milano (IT), Baccini Ltd (IT), TecnoFimes Ltd (IT), Enerpoint (IT), Università di Firenze (IT), Quanta System Corp. (IT), Elettrosystem Limited Co. (IT), Panariagroup Industrie Ceramiche Corp. (IT), Sacmi Group (IT), PEMCO Euroinks (IT), ICIE (IT), Centro Ceramico – Bologna (IT), Elettronica Santerno (IT), Elettrorava Corp. (IT), Dallera Ltd (IT).

Invited talk:

- *"The second generation of solar cells: The CdTe technology – From laboratory to industry".* Solar Asia – 2013, 2nd International Conference on Solar Energy Materials, Solar Cells and Solar Energy Applications – University of Malaya, 22-24 August, Kuala Lumpur, – MALAYSIA.

- *"Thin film technologies for BIPV*". Technologies, installation techniques and the photovoltaic market, Conference Hall – Hotel La Torre, 15 Oct. 2012, Mondello, Palermo – ITALY.

- "*Series electrical integration of polycrystalline CdTe- and CuInGaSe2-based thin-film solar cells".* Europe Day, St. Elizabeth Conference Centre - Campus of the University of Parma, May 6, 2011, Parma – ITALY.

- *"Manufacturing of CdTe thin film photovoltaic modules".* E-MRS 2010 Spring Meeting, Symposium M: Thin Film Chalcogenide Photovoltaic Materials, June 7-11, 2010, Strasbourg – FRANCE.

- "*The second generation: CdTe and CuInGaSe$_2$ thin film solar cells".* Workshop on renewable energy: the mexican challenges pass through photovoltaic energy? Centro de Investigacion y de Estudios Avanzados del I.P.N. Unidad Merida, Departamento de Fisica Aplicada, July 17-18, 2010 – Merida, Yucatan – Mexico.

- "*CdTe and CuInGaSe$_2$ thin film PV modules: the second-generation".* Italian Crystal Growth 2010 – Progress in Functional Materials. November 18-19, 2010, IMEM CNR Parma – ITALY.

- Panel discussion entitled: *"PV from first to the third generation: the research development and application"*, HTE – HI TECH EXPO 2010 - PV TECH, November 18, 2010, Exhibition Fair-Milano RHO – ITALY.

- *"Environmentally friendly technologies for the CdTe and CIGS based modules production".* PV ROME Mediterranean 2009. Photovoltaic solar energy: a strategic sector for economic growth, scientific research and environmental protection. September 30 – October 2, 2009, New fair of Rome – ITALY.

- "*The second-generation of solar cells: the CdTe and CuInGaSe$_2$ thin films - from lab to industry*". III National Congress of the Italian Association of Energy Operators - AIGE, June 4-5, 2009, Parma – ITALY.

- *"State of the art and future prospects of the thin-film PV technologies".* CIS-IT Italian Solar Industry Conference. Quality and technology in photovoltaics. February 5-6, 2009, Rome – ITALY.

- "*Towards the mass production: thin-film PV"*. HTE – HI TECH EXPO 2009- PV TECH - PV thin-film production technologies. November 25, 2009, Exhibition Fair-Milano RHO – ITALY.

- "*The Arendi Project"*. Solar Expo, May 15-17, 2009. Verona-Fair, Verona – ITALY.

- "*The second-generation of solar cells: the CdTe and $CuInGaSe_2$ thin films"*, ITALIAN PHYSICAL SOCIETY, XCIV National Congress. September 22-27, 2008, phisycs Department, University of Genova, Genova – ITALY.

- "*From Research to Industrial Production: The CdTe/CdS Thin Film PV Modules".* RINNOVA –Energy Frontiers (ENEL). 2020 Objective: the Italian Contribution to the European Challenge, Enel Conference Center, December 4, 2007, Rome – ITALY.

- "*Polycrystalline Thin Solar Cells: The Case of CdTe".* NANOFORUM - Energy & Environment, September 18-19, 2007, Politecnico of Milan, Milan – ITALY.

Referee Activity:

Crystal Research and Technology – Wiley
Journal of Vacuum Science and Technology - American Institute of Physics (AIP)
Journal of Physics D: Applied Physics – INSTITUTE OF PHYSICS (IOP) Publishing
Materials Science and Engineering: B Advanced Functional Solid-State Materials – Elsevier
Journal of Luminescence – Elsevier
Materials Science in Semiconductor Processing – Elsevier
Thin Solid Films – Elsevier
Materials Chemistry and Physics – Elsevier
Journal of Materials Processing Technology – Elsevier
International Journal of Photoenergy – Hindawi
Solar Energy - Elsevier
International Scholarly Research Network (ISRN) – Member of the editorial board – Hindawi

Teaching activities:

2014 – 2015
- *Advanced Physical Technologies for Energy and Environment*– Degree in Physics

2013 – 2014
- *Physical Instrumentation* – Degree in Physics

2012 – 2013
- *Physical Instrumentation* – Degree in Physics

2010 – 2011
- *Laboratory of physics of semiconductor* – Master degree in Science and Technology of Advanced Materials.
- *Vacuum and Low Temperature Technologies* – Degree in Physics

2009 – 2010
- *Laboratory of physics of materials* – Master degree in Science and Technology of Advanced Materials.

2008 – 2009
- *Laboratory of Mechanics* – Degree in Science and Technology of Materials.
- *Laboratory of Thermodinamics* – Degree in Science and Technology of Materials.

2005 – 2010
- *Thin films deposition techniques* – Master degree in Science and Technology of Advanced Materials.

2004 – 2009
- *Physical Instrumentation for Cultural Heritage* – Master Degree in Cultural Heritage.

2003 – 2010
- *Thin films deposition techniques* – Master degree in Science and Technology of Advanced Materials.

1999 – 2001
- *Laboratory of Materials II* – School of Specialization in Science and Technology of Materials.

List of publications

Papers

1. Romeo N, Canevari V, Sberveglieri G, **Bosio A**, Zanotti L (1986). Growth of large-grain CuInSe2 thin films by flash-evaporation and sputtering. SOLAR CELLS, vol. 16, p. 155-164, ISSN: 0379-6787, doi: 10.1016/0379-6787(86)90081-5
2. Romeo N, **Bosio A**, Canevari V, Seuret D (1987). Low resistivity CdS thin films grown by r.f. sputtering in an Ar-H2 atmosphere. SOLAR CELLS, vol. 22, p. 23-27, ISSN: 0379-6787, doi: 10.1016/0379-6787(87)90067-6
3. Romeo N, **Bosio A**, Canevari V (1988). Zinc Cadmium Sulphide (Zn0.15Cd0.85S) thin-films by rf sputtering in an Ar-H2 atmosphere. PHYSICA STATUS SOLIDI. A, APPLIED RESEARCH, vol. 109, p. K105-K109, ISSN: 0031-8965, doi: 10.1002/pssa.2211090238

4. Romeo N, **Bosio A**, Canevari V, Spaggiari C, Zini L (1989). P-type cadmium telluride thin films doped during growth by neutral high energy nitrogen atoms. SOLAR CELLS, vol. 26, p. 189-195, ISSN: 0379-6787, doi: 10.1016/0379-6787(89)90080-X
5. Romeo N, **Bosio A**, Canevari V (1992). Large Crystalline Grain CdTe Thin Films for Photovoltaic Application. INTERNATIONAL JOURNAL OF SOLAR ENERGY, vol. 12, p. 183-186, ISSN: 0142-5919, doi: 10.1080/01425919208909761
6. Romeo N, Cozzi S, Tedeschi R, **Bosio A**, Canevari V, Tagliente M A, Pensa M (1999). High quality ZnS:Mn thin films grown by quasi-rheotaxy for electroluminescent devices. THIN SOLID FILMS, vol. 348, p. 49-55, ISSN: 0040-6090, doi: 10.1016/S0040-6090(99)00009-7
7. Romeo N., **A. Bosio**, R. Tedeschi, A. Romeo, V. Canevari (1999). A highly efficient and stable CdTe/CdS thin film solar cell. SOLAR ENERGY MATERIALS AND SOLAR CELLS, vol. 58, p. 209-218, ISSN: 0927-0248
8. Romeo N, Tedeschi R, Ferrari L, Pasquali S, **Bosio A**, Canevari V (2000). Monte Carlo computer simulation of the deposition of CdTe thin films by close-spaced sublimation. MATERIALS CHEMISTRY AND PHYSICS, vol. 66, p. 259-265, ISSN: 0254-0584, doi: 10.1016/S0254-0584(00)00315-1
9. Romeo N, **Bosio A**, Tedeschi R, Canevari V (2000). Growth of polycrystalline CdS and CdTe thin layers for high efficiency thin film solar cells. MATERIALS CHEMISTRY AND PHYSICS, vol. 66, p. 201-206, ISSN: 0254-0584, doi: 10.1016/S0254-0584(00)00316-3
10. Romeo N, **Bosio A**, Tedeschi R, Canevari V (2000). Back contacts to CSS CdS/CdTe solar cells and stability of performances. THIN SOLID FILMS, vol. 361-362, p. 327-329, ISSN: 0040-6090, doi: 10.1016/S0040-6090(99)00765-8
11. Romeo N, Fermi F, Tedeschi R, **Bosio A**, Canevari V, Cozzi S (2001). Large grain electroluminescent ZnS:Mn thin films grown by quasi-rheotaxy on insulating materials. THIN SOLID FILMS, vol. 384, p. 138-145, ISSN: 0040-6090, doi: 10.1016/S0040-6090(00)01825-3
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