

## PERSONAL INFORMATION

## Marilena Vivona



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## WORK EXPERIENCE

30th Sep 2019 up to now

**Permanent member of Research Staff at National Research Council (CNR) of Italy - Institute for Microelectronics and Microsystems (IMM) of Catania (Italy)**

**Micro/Nano Electronics domain**

Experimental investigation on advanced Silicon Carbide (SiC) devices for high Power Electronics applications. Electrical, morphological and structural characterizations of MOS capacitors, Ohmic and Schottky contacts.

**Skills**

- Atomic Force Microscopy applying various configurations (AFM, C-AFM).
- I-V and C-V characterizations of MOS capacitors, Schottky and Ohmic contacts. TLM characterization. Oxide reliability testing stressed by thermal ageing.
- Sample preparation for TEM analysis Structural Analysis (XRD, TEM, EDX, SEM): arrangement of the results, measurements supported by technical operator.
- Clean-room (ISO 4) operations for device fabrication: processing of devices (cleaning, laser beam lithography (with technician), thermal oxidation, metal deposition by rf-magnetron sputtering, wet and dry etching, thermal treatments).

3<sup>rd</sup> May 2019 - 30<sup>th</sup> June 2019

**Visiting Researcher at the Opto-Electronics Research Centre (ORC) - University of Southampton (UK)**

1<sup>st</sup> Apr 2016 - 31<sup>st</sup> March 2019

**Research Fellow at the Opto-Electronics Research Centre (ORC) - University of Southampton (UK)**

Bldg 53 - Highfield Campus - University of Southampton - SO17 1BJ Southampton UK

Research Fellow in the Preform Rare-Earth Profiler (PREP) project (P.I.: Prof. M. N. Zervas).

**Optics domain**

Design, Development and Test of an imaging and detection platform for Optical Preform Profiling. Specifically:

- Refractive index profiling by transmitted-ray deflection measurements.
- Active-dopant distribution and concentration evaluation in Rare-Earth-doped optical preforms through computed tomography-like technique. Application of the Inverse Radon and Abel transforms to rebuild the Rare-Earth ion profile in the core of the optical preform.

**Skills**

- Scientific and financial Interaction with optical and electronic components suppliers.
- Set-up of optoelectronic benches for investigations and material validations.
- Transformation Optics.
- Spectroscopy measurements.
- SEM and EDX trained.

9<sup>th</sup> Feb 2015 - 8<sup>th</sup> Mar 2016

**Granted with Post-Doc Fellowship at CNR-IMM**

1<sup>st</sup> Oct 2012 - 31<sup>st</sup> Jan 2015

**Granted with Marie Curie Fellowship (ESR -European NetFiSiC project) at CNR-IMM**

CNR - Istituto per la Microelettronica e Microsistemi (IMM) - Strada VIII n.5, Zona Industriale I95121 Catania - ITALY([marilena.vivona@imm.cnr.it](mailto:marilena.vivona@imm.cnr.it))

**Micro/Nano Electronics domain**

Experimental investigation on advanced Silicon Carbide (SiC) devices for high Power Electronics applications. Electrical, morphological and structural characterizations of MOS capacitors, Ohmic and Schottky contacts.

**Skills**

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**ADDITIONAL SCIENTIFIC  
ACTIVITY**

18 <sup>th</sup> March 2022	<b>Doctoral Dissertation comitee member</b> Marine Aubry, <i>Coupled experimental and theoretical study of combined radiation and temperature effects on fiber-based amplifiers</i> , PhD in Optics, Photonics and Hyperfrequencies, Université de Lyon - France
24 <sup>th</sup> October 2021	<b>Tutorial Day of the ECSCRM 2020-2021 conference</b> (24 – 28 October 2021 - Tours, France) 1990-2020: 30 YEARS OF SiC DEVICE DEVELOPMENT From technology to applications
March 2019	<b>Trining for the use of SEM and combined EDX analysis facility</b>
7 <sup>th</sup> - 18 <sup>th</sup> April 2016	<b>Guidance on the safe use of lasers in education and reserach</b>
4 <sup>th</sup> - 9 <sup>th</sup> October 2015	<b>Member of the Local Organizing Comitee of the ICSCRM 2015 conference</b>
4 <sup>th</sup> October 2015	<b>Tutorial Day of the ICSCRM 2015 conference</b> (4 <sup>th</sup> – 9 <sup>th</sup> October 2015 - Giardini Naxos, Italy) SiC materials and technology: from the past towards the future
10 <sup>th</sup> - 13 <sup>th</sup> November 2014	<b>Visiting Researcher at the Friedrich-Alexander-University (FAU) of Erlangen-Nuremberg (Germany)</b> Study on the electrical behavior of MOS capacitors by bias-temperature stress measurements.
21 <sup>st</sup> September 2014	<b>Tutorial Day of the conference ECSCRM 2014</b> (21 <sup>st</sup> – 25 <sup>th</sup> September 2014 - Grenoble, France) Characterization methods applied to SiC: from material to devices.
25 <sup>th</sup> May 2014	<b>Tutorial Day of the workshop ISiCPEAW 2014</b> (25 <sup>th</sup> – 27 <sup>th</sup> May 2014 - Stockholm, Sweden) Power electronics applications of silicon carbide technology.
28 <sup>th</sup> April 2014- 11 <sup>th</sup> May 2014	<b>Visiting Researcher at the Friedrich-Alexander-University (FAU) of Erlangen-Nuremberg (Germany)</b> Study on the electrical behavior of MOS capacitors by admittance spectroscopy.
29 <sup>th</sup> September 2013	<b>Tutorial Day of the conference ICSCRM 2013</b> (29 <sup>th</sup> September – 4 <sup>th</sup> October 2013 - Miyazaki, Japan) Advanced materials for high power application
5 <sup>th</sup> July 2013	<b>Visiting Researcher at the Université Claude Bernard - Lyon (France)</b> Growth of epitaxial layer in SiC technology.
30 <sup>th</sup> Jan 2012-10 <sup>th</sup> Feb 2012	<b>Campaigns at the Commissariat à l'énergie atomique et aux énergies alternatives (CEA) of Arpajon, Paris (France)</b>
17 <sup>th</sup> - 28 <sup>th</sup> January 2011	
11 <sup>th</sup> - 22 <sup>th</sup> January 2010	On-line characterization of Yb/Er-doped optical fiber amplifiers under gamma-ray radiations.

## Referee for International Journals

## Reviewer

**OSA** publications (*Optics Letters, Applied Optics, Optical Materials Express, Optics Express, JOSA B*)

**Trans. Tech. Publications INC** (*Material Science Forum*)

**IEEE** Publications (*Transactions on Electron Devices*)

**AIP** Publications (*Journal of Applied Physics, Applied Physics Letters*)

**MDPI** (*Photonics, Applied Sciences, Electronics, Crystals, Electronic Material*)

**ELSEVIER** (*Applied Surface Science, Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms, The European Physical Journal Plus, Solid-State Electronics, Materials Science in Semiconductor Processing*)

**ACS Publications** (*Applied Materials & Interfaces*)

## Member of Editorial Board

"*Scanning*" (Hindawi and John Wiley & Sons Publishing Partnership)

- Impact Factor 1.932 - ISSN: 0161-0457 (Print); ISSN: 1932-8745 (Online)

## Member of Editor Topic Team

"*Materials*" (MDPI) - Impact Factor 3.623 - ISSN: 1996-1944

## EDUCATION

31<sup>st</sup> May 2021

## National Scientific Qualification (Abilitazione Scientifica Nazionale, ASN)

"Associated" degree in the Italian academic recruitment system.

Call 2018/2020 (Ministerial Decree n. 2175/2018) for the disciplinary field of 02/B1 – Experimental Physics of Matter, according to the national classification.

The validity of the qualification is nine years, starting from 31/05/2021.

October 2009 - September 2012

## PhD in Optics and Photonics

Issued in Partnership Program (cotutelle in French) between the Laboratoire Hubert Curien and the Physics Department of Palermo, under the supervision of Prof. Youcef Ouerdane and Prof. Marco Cannas.

- Laboratoire Hubert Curien - 18, Rue B. Lauras - F-42000 Saint-Etienne – France

- Dipartimento di Fisica, Università degli Studi di Palermo - via Archirafi, 36- I90123 Palermo – Italy

Thesis title: Radiation hardening of optical fiber amplifier - Thesis Dissertation July 4<sup>th</sup> 2013.

- Private subvention from the industry ixFiber SAS (Lannion, France).
- Awarded by the VINCI grant 2010 for the Mobility in PhD Thesis (Partnership Program): 4500 €.

## Optics and Photonics domain

Experimental investigation on Er/Yb-doped fibres for high performance optical amplifiers designed for space applications. Spectroscopic characterization in the IR-Vis-UV domain. Study of the microscopic mechanisms responsible for performance degradation and evaluation of the hardening solutions (Ce-codoping and H<sub>2</sub>-loading).

## Skills

- Handling with optical fibre (stripping, cleaving, splicing and connection of optical fibres)
- Mechanical polishing and measurements of optical preforms.

- Stationary and time-resolved luminescence spectroscopy with various laser sources, continuous or pulsed, from UV to IR.
- Absorption and wavelength-dependent luminescence spectroscopy.
- Confocal microscopy: Raman and Luminescence.
- Active and passive characterizations under gamma-ray irradiation of optical fibres as part of an optical amplifier.

User of the Gamma-ray facility and Semiconductor X-ray irradiator at the *Commissariat à l'énergie atomique et aux énergies alternatives* (CEA) of Arpajon in Paris- FRANCE.

Attended courses during the PhD:

- Photonics at short and ultra-short times. Engineering of the laser pulses: from nanosecond to femto-second (Saint-Etienne, France, 2011).
- Introduction to the scanning electron microscopy and elemental micro-analysis applied to materials (Saint-Etienne, France, 2011).
- Surfaces functionalized by optical micro/nano-structurations (Saint-Etienne, France, 2012).

Academic years  
1999/2000 - 2006/2007

### Master degree in Physics

Dipartimento di Scienze Fisiche e Astronomiche, Università di Palermo - via Archirafi, 36 I-90123 Palermo – ITALY

Thesis title: *Effects of Gallium on the optical properties of SiO<sub>2</sub>* (solid-state physics field) under the supervision of Prof. Marco Cannas. Evaluation: 106/110 (March 20<sup>th</sup>, 2008)

### PERSONAL SKILLS

Mother tongue  
Other language(s)

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
Italian					
English	C1	C1	B2	B2	C1
French	C1	C1	B2	B2	C1

Common European Framework of Reference for Languages: A1/A2: Basic User – B1/B2: Independent User – C1/C2: Proficient User

### Driving Licence

B (Italian Licence)

### Computer skills

- Operating System: Windows XP - 7 - 8.
- Office applications: Word, Excel, PowerPoint.
- Document Markup Language: Latex.
- Data Analysis: Sigmaplot, Origin, Peakfit.
- Programming Languages: Matlab, Mathematica.
- Graphics Software: CorelDraw, Gimp.
- Image Processing: ImageJ,
- Instruments software.
- Email and Internet.

REFERENCES ARE AVAILABLE ON REQUEST.

## SCIENTIFIC PRODUCTION

## SELECTED PAPERS

1. **Materials and Processes for Schottky Contacts on Silicon Carbide**  
M. Vivona, F. Giannazzo and F. Roccaforte  
*Materials*, vol.15 (2022) 298 – REVIEW paper
2. **Temperature and time dependent electron trapping in Al<sub>2</sub>O<sub>3</sub> thin films onto AlGaN/GaN heterostructures**  
P. Fiorenza, E. Schilirò, G. Greco, M. Vivona, M. Cannas, F. Giannazzo, R. Lo Nigro and F. Roccaforte  
*Applied Surface Science*, vol. 579 (2022) 152136.
3. **Ni Schottky barrier on heavily doped phosphorus implanted 4H-SiC**  
M. Vivona, G. Greco, M. Spera, P. Fiorenza, F. Giannazzo, A. La Magna and F. Roccaforte  
*Journal of Physics D: Applied Physics*, vol.54 (2021) 445107.
4. **Electrical properties of inhomogeneous tungsten carbide Schottky barrier on 4H-SiC**  
M. Vivona, G. Greco, G. Bellocchi, L. Zumbo, S. Di Franco, M. Saggio, S. Rascunà and F. Roccaforte  
*Journal of Physics D: Applied Physics*, vol.54 (2021) 055101.
5. **Active dopant profiling and Ohmic contacts behavior in degenerate n-type implanted silicon carbide**  
M. Spera, G. Greco, A. Severino, M. Vivona, P. Fiorenza, F. Giannazzo and F. Roccaforte  
*Applied Physics Letters*, vol.117 (2020) 013502.
6. **Electrical and structural properties of surfaces and interfaces in Ti/Al/Ni Ohmic contacts to p-type implanted 4H-SiC**  
M. Vivona, G. Greco, C. Bongiorno, R. Lo Nigro, S. Scalese and F. Roccaforte  
*Applied Surface Science*, vol. 420 (2017) pp. 331-335.
7. **Effect of Germanium doping on electrical properties of n-type 4H-SiC homoepitaxial layers grown by chemical vapor deposition**  
T. Sledziewski, M. Vivona, K. Alassaad, P. Kwasnicki, R. Arvinte, S. Beljakowa, H. B. Weber, F. Giannazzo, H. Peyre, V. Souliere, T. Chassagne, M. Zielinski, S. Juillaguet, G. Ferro, F. Roccaforte and M. Krieger  
*Journal of Applied Physics*, vol. 120 (2016) pp. 205701 1-7.
8. **Near interface traps in SiO<sub>2</sub>/4H-SiC metal-oxide-semiconductor field effect transistors monitored by temperature dependent gate current transient measurements**  
P. Fiorenza, A. La Magna, M. Vivona and F. Roccaforte  
*Applied Physics Letters*, vol. 109 (2016) pp. 012012 1-5.
9. **Electrical properties of SiO<sub>2</sub>/SiC interfaces on 2°-off axis 4H-SiC epilayers**  
M. Vivona, P. Fiorenza, T. Sledziewski, M. Krieger, T. Chassagne, M. Zielinski and F. Roccaforte  
*Applied Surface Science* vol. 364 (2016) pp. 892-895.
10. **Ti/Al/W ohmic contacts to p-type implanted 4H-SiC**  
M. Vivona, G. Greco, R. Lo Nigro, C. Bongiorno and F. Roccaforte  
*Journal of Applied Physics*, vol. 118 (2015) pp. 035705 1-7.
11. **Thermal stability of the current transport mechanisms in Ni-based Ohmic contacts on n- and p-implanted 4H-SiC**  
M. Vivona, G. Greco, F. Giannazzo, R. Lo Nigro, S. Rascunà, M. Saggio, F. Roccaforte  
*Semiconductor Science and Technology*, vol. 29 (2014) pp. 075018 1-7.
12. **Recent advances on dielectrics technology for SiC and GaN power devices**  
F. Roccaforte, P. Fiorenza, G. Greco, M. Vivona, R. Lo Nigro, F. Giannazzo, A. Patti and M. Saggio  
*Applied Surface Science*, vol. 301 (2014) pp. 9-18.
13. **Comparative study of gate oxide in 4H-SiC lateral MOSFETs subjected to post-deposition-annealing in N<sub>2</sub>O and POCl<sub>3</sub>**  
P. Fiorenza, L. K. Swanson, M. Vivona, F. Giannazzo, C. Bongiorno, A. Frazzetto and F. Roccaforte  
*Applied Physics A*, vol.115 (2014) pp. 333-339.
14. **SiO<sub>2</sub>/4H-SiC interface doping post-deposition annealing of the oxide in N<sub>2</sub>O or POCl<sub>3</sub>**  
P. Fiorenza, F. Giannazzo, M. Vivona, A. La Magna and F. Roccaforte  
*Applied Physics Letters*, vol. 103 (2013) pp. 153508 1-4.
15. **Design of Radiation-Hardened Rare-Earth Doped Amplifiers Through a Coupled Experiment/Simulation Approach**

- S. Girard, L. Mescia, **M. Vivona**, A. Laurent, Y. Ouerdane, C. Marcandella, F. Prudenzeno, A. Boukenter, T. Robin, P. Paillet, V. Goiffon, M. Gaillardin, B. Cadier, E. Pinsard, M. Cannas and R. Boscaino  
*Journal of Lightwave Technology*, vol. 31 (2013) pp. 1247-1254.
16. **Radiation hardening techniques for Er/Yb doped optical fibers and amplifiers for space application**  
S. Girard, **M. Vivona**, A. Laurent, B. Cadier, C. Marcandella, T. Robin, E. Pinsard, A. Boukenter and Y. Ouerdane  
*Optics Express*, vol. 20 (2012) pp. 8457-8465.
17. **Influence of Ce<sup>3+</sup>- Codoping on the Photoluminescence Excitation Channels of Phosphosilicate Yb/Er-Doped Glasses**  
**M. Vivona**, S. Girard, T. Robin, B. Cadier, L. Vacarro, M. Cannas, A. Boukenter, Y. Ouerdane  
*IEEE Photonics Technology Letters*, vol. 24 (2012) pp. 509-511.
18. **Influence of Ce codoping and H<sub>2</sub> pre-loading on Er/Yb-doped fiber: Radiation response characterized by Confocal Micro-Luminescence**  
**M. Vivona**, S. Girard, C. Marcandella, T. Robin, B. Cadier, M. Cannas, A. Boukenter and Y. Ouerdane  
*Journal of Non-Crystalline Solids*, vol. 357 (2011) pp. 1963-1965.

## CONFERENCES

Conferences: contribution as [presenting-author](#)

- 13<sup>th</sup> European Conference on Silicon Carbide and Related Materials (ECSCRM) 2020-2021 - (Hybrid Conference)  
Virtual Participation – 24-28 October 2021  
  - a) *Electrical properties of Ni/heavily-doped 4H-SiC Schottky contacts*  
(**ORAL, first author**).
  - b) *Current conduction mechanism in forward and reverse biased WC Schottky contact on 4H-SiC Electrical characterization of W-based Schottky barrier on 4H-SiC*  
(**POSTER, first author**).
- International Workshop on Silicon Carbide in Europe (SiCE) 2020 - (Virtual Conference)  
Virtual Conference – 19 November 2020  
*Current conduction mechanism in forward and reverse biased WC Schottky contact on 4H-SiC* (**ORAL, first author**).
- OSA Advanced Photonics Congress - Specialty Optical Fibers (SOF) Meeting 2018  
Zurich (Switzerland) – 2-5 July 2018  
*Non-destructive microscopic characterization of optical fiber* (**ORAL, first author**)
- 16<sup>th</sup> International Conference on Silicon Carbide and Related Materials (ICSCRM) 2015  
Giardini-Naxos (Italy) – 4-9 October 2015  
  - a) *Processing and characterization of MOS capacitors fabricated on 2°-off axis 4H-SiC epilayers* (**POSTER, first author**)
  - b) *X-ray irradiation on 4H-SiC MOS capacitors processed under different annealing conditions* (**POSTER, first author**).
- 10<sup>th</sup> European Conference on Silicon Carbide and Related Materials (ECSCRM) 2014  
Grenoble (France) – 21-25 September 2014  
  - a) *Evolution of electrical and structural properties of Ti/Al/W contacts to p-type implanted 4H-SiC upon thermal annealing*  
(**ORAL, first author**)
  - b) *Preliminary study on the effect of micrometric Ge-droplets on the characteristics of Ni/4H-SiC Schottky contacts*  
(**POSTER, first author**).
- 15<sup>th</sup> International Conference on Silicon Carbide and Related Materials (ICSCRM) 2013  
Miyazaki (Japan) – 29 September - 4 October 2013  
  - a) *Temperature-dependence of the electrical characteristics in Ni<sub>2</sub>Si Ohmic contacts on n- and p-type implanted 4H-SiC*  
(**POSTER, first author**)
  - b) *Electrical characteristics of Schottky contacts on Ge-doped 4H-SiC* (**POSTER, first author**).



7. **9<sup>th</sup> International Conference on Space Optics (ICSO) 2012**  
Ajaccio (France) – 9-12 October 2012  
*Radiation hardening of Rare-Earth doped fiber amplifiers (ORAL, first author).*
8. **32<sup>nd</sup> Journées Nationales d'optique guidée (JNOG) 2012**  
Lyon (France) – 10-12 July 2012  
*Réponse aux radiations des fibres optiques phosphosilicates dopées aux terres rares : mécanismes de durcissement liés au codopage au Ce (ORAL, first author).*
9. **9<sup>th</sup> Symposium “Advanced Dielectrics and Related Devices” (SiO<sub>2</sub>) 2012**  
Hyères (France) – 17-20 June 2012  
*Radiation responses of Yb/Er-doped phosphosilicate optical fibers: hardening mechanisms related to Ce-codoping (ORAL, first author).*
10. **Journée de la Recherche 2012**  
Saint-Etienne (France) – 14 June 2012  
*Durcissement aux radiations de fibres optiques dopées aux Terres Rares (POSTER, first author).*
11. **2<sup>nd</sup> journées "Tenue des fibres optiques en Milieu Radiatif"**  
Saint-Etienne (France) – 7-8 November 2011  
*Durcissement aux radiations des fibres optiques dopées aux Terres Rares pour applications spatiales (ORAL, first author).*
12. **iXTech Meeting 2011**  
Le Port Marly (France) – 22 September 2011  
*Durcissement aux radiations de fibres optiques dopées aux Terres Rares et d'amplificateurs à fibres optiques (POSTER, first author).*
13. **Symposium of the Leadership in Fiber Laser Technology (LIFT) project - European Commission funded project 2008-2013**  
Lannion (France) – 12 July 2011  
*Radiation hardening of Rare Earth doped fiber amplifiers: active and passive characterization (ORAL, first author).*
14. **31<sup>st</sup> Journées Nationales d'optique guidée (JNOG) 2011**  
Marseille (France) – 4-7 July 2011  
*Durcissement aux radiations de fibres optiques dopées Terres Rares et d'amplificateurs à fibres optiques (POSTER, first author).*
15. **8<sup>th</sup> Symposium “Advanced Dielectrics and Related Devices” (SiO<sub>2</sub>) 2010**  
Varenna (Italy) – 21-23 June 2010  
*Influence of Ce co-doping and H<sub>2</sub> pre-loading on Er/Yb doped fiber: Radiation response characterized by Confocal Micro-Luminescence (POSTER, first author).*

DATA

FIRMA

20/06/2022

