

CURRICULUM VITAE

FORMATO EUROPEO/EUROPEAN FORMAT

PERSONAL INFORMATION

Name **PATRICK FIORENZA**
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Nationality Italian
Date of birth 26.02.1980

WORK EXPERIENCE

CNR code: **N. MATRICOLA 14556**

Dates (from – to)	From 1st December 2011 up today
Name and address of employer	IMM-CNR, Catania (Istituto per la Microelettronica e Microsistemi del Consiglio Nazionale delle Ricerche)
Type of business or sector	Innovative materials for Power electronics and Radio frequency applications
Occupation or position held	Researcher Level III
Main activities and responsibilities	Responsible for the Scanning Probe Microscopy (SPM) laboratory at IMM-CNR Catania; In charge for the research activity on “nanocharacterization of dielectrics materials for power electronics applications”
Date	From December 2006 to December 2010
Occupation or position held	Post-Doc
Name and address of employer	IMM-CNR, Catania (Istituto per la Microelettronica e Microsistemi del Consiglio Nazionale delle Ricerche)
Tutor	Dr. Vito Raineri
Main activities and responsibilities	Innovative capacitors with high capacitance density for Power electronics and Radio frequency applications
Funding	NUOTO Project (New materials with Ultra high k dielectric constant for Tomorrow wireless electronics) Grant No. NMP3-CT-2006-032644
Date	From December 2010 to December 2011
Occupation or position held	Post-Doc
Name and address of employer	IMM-CNR, Catania (Istituto per la Microelettronica e Microsistemi del Consiglio Nazionale delle Ricerche)
Tutor	Dr. Vito Raineri
Main activities and responsibilities	Fabrication and characterization of high capacitance density capacitors
Funding	LAST POWER (european project)
Date	From 1st February to 30th August 2005
Occupation or position held	Scholarship founded by Marie Curie project APROTHIN

Name and address of employer	IMEC Leuven (Belgium)
Tutor	Prof. Wilfried Vandervorst
Main activities and responsibilities	Charge trapping studies at nanometer scale by SPM
Main activities and responsibilities	Characterization by SPM of radiofrequency MEMS devices

EDUCATION AND TRAINING

Date	2003- 2006
	Ph.D. in Materials Science
Name and type of organisation providing education and training	Università di Catania, Italia.
Principal subjects occupational skills covered	Scanning Probe Microscopy (SPM); dielectrics; semiconductor devices
Title of qualification awarded	19.02.2007
Level in National classification	Level 8
Date	1998-2003
Name and type of organisation providing education and training	Università di Catania, Italia
Principal subjects occupational skills covered	Solid state Physics; Semiconductors Physics; Materials Physics; Molecular Spectroscopy Structure of Matter.
Title	Laurea in Fisica.
Title of qualification awarded	28.10.2003
Mark	109/110.
Thesis Title	"Conduzione e intrappolamento di carica in ossido di praseodimio (Pr ₂ O ₃)".
Tutors	Prof. E. Rimini, Dr. V. Raineri and Dr. R. Lo Nigro (CNR-IMM), Catania, Italy.

RESEARCH AND ACADEMIC ACTIVITIES

Research sectors	Interaction between novel insulators material onto wide band gap semiconductors (SiC, GaN). Wide band gap semiconductor devices characterization (Diodes, MOSFETs, HEMTs, ecc). Development of novel scanning probe methodologies for the physical investigation in wide band gap semiconductors and dielectrics.
Recent Scientific Activities.	Development of capacitors for power electronics application, focusing on the nanoscale electrical properties of thin insulating layers (interface carrier transport, charge trapping and dielectric breakdown).
Awards	<ul style="list-style-type: none"> - Best paper Award at the INTERNATIONAL RELIABILITY PHYSICS SYMPOSIUM (IRPS) 2021 - - International Granted Patent Award at the CONGRESSO D'ISTITUTO CNR-IMM 2021
Tutoring	<p>-2007-2008: Master degree thesis in Physics: "Fenomeni di permittività gigante in $\text{CaCu}_3\text{Ti}_4\text{O}_{12}$" student Giuseppe Naselli, Dipartimento di Fisica ed Astronomia di Catania, A.A. 07-08 .</p> <p>-2012-2013: Master degree thesis in Biology : "UTILIZZO DI TECNICHE DI MICROSCOPIA ELETTRONICA PER LO STUDIO DI CELLULE MESENCHIMALI: OSSERVAZIONI PRELIMINARI" student Elisa Ferrera, Dipartimento di Scienze Biologiche, Geologiche e Ambientali di Catania, A.A. 12-13 .</p> <p>-2015-2016: Master degree thesis in Electrical Engineering: "Intrappolamento di carica in sistemi SiO_2/SiC: Impatto sulla stabilità di soglia in MOSFETs di potenza" student Francesca Mignemi, Dipartimento di Ingegneria di Catania, A.A. 15-16 .</p>
Teaching	<p>-Università degli Studi di Catania. Incarico di Docenza al Dottorato di Ricerca XXVII ciclo (2012). "Struttura e funzionamento di dispositivi elettronici di potenza. Integrati. Moduli di potenza" (10 ore)</p> <p>-Università degli Studi di Catania. Incarico di Docenza al Dottorato di Ricerca XXVII ciclo (2012). "Tecniche di caratterizzazione morfologica e microscopica dei materiali organici ed inorganici usati nei dispositivi di potenza" (20 ore)</p>
Evaluator expert (EU projects)	<p>EU Call Technologies for European non-dependence and competitiveness (SPACE-10-TEC-2018-2020): JTF-2018/20-16 – Active discrete power components [U14] April-May 2018 n. protocollo Contract Number: CT-EX2018D321514-101del 13/04/2018</p>
Projects as principal investigator	<p>Title: inSulated gallium nitride Transistors foR Electric vHicle Technology (STREET) IEC\R2\212103 - International Exchanges 2021 Cost Share (Italy) della ROYAL SOCIETY (UK) Grant del 06/12/2021</p> <p>Title: Deposizione mediante ablazione laser impulsato di semiconduttori 2D su Nitruuri per elettronica avanzata (PULSE) Accordo di cooperazione scientifica tra il CNR e la SAS (Rep. Slovacca). Progetti comuni selezionati per il biennio 2020-2021 prot 0013343/2020 del 20/02/2020</p> <p>Title:GRIFONE: Graphitic films of group III nitrides and group II oxides: platform for fundamental studies and applications European Flag-ERA project VR Dnr. 2015-06816</p> <p>Title:AdvanSiC: Advances in Cost-Effective HV SiC Power Devices for Europe's Medium Voltage Grids European KTD JU Project; Grant Agreements: 101075709</p>

Selected recent Publications

- Fiorenza, P., Bongiorno, C., Giannazzo, F., Alessandrino, M.S., Messina, A., Saggio, M., Roccaforte, F.
Interfacial electrical and chemical properties of deposited SiO₂ layers in lateral implanted 4H-SiC MOSFETs subjected to different nitridations (2021) *Applied Surface Science*, 557, art. no. 149752
- Fiorenza, P., Schilirò, E., Giannazzo, F., Bongiorno, C., Zielinski, M., La Via, F., Roccaforte, F.
On the origin of the premature breakdown of thermal oxide on 3C-SiC probed by electrical scanning probe microscopy (2020) *Applied Surface Science*, 526, art. no. 146656, .
- Fiorenza, P., Giannazzo, F., Cascino, S., Saggio, M., Roccaforte, F.
Identification of two trapping mechanisms responsible of the threshold voltage variation in SiO₂/4H-SiC MOSFETs (2020) *Applied Physics Letters*, 117 (10), art. no. 103502.
- Fiorenza, P., Alessandrino, M.S., Carbone, B., Di Martino, C., Russo, A., Saggio, M., Venuto, C., Zanetti, E., Giannazzo, F., Roccaforte, F.
Understanding the role of threading dislocations on 4H-SiC MOSFET breakdown under high temperature reverse bias stress (2020) *Nanotechnology*, 31 (12), art. no. 125203.
- Fiorenza, P., Giannazzo, F., Roccaforte, F.
Characterization of SiO₂/4H-SiC interfaces in 4H-SiC MOSFETs: A review (2019) *Energies*, 12 (12), art. no. 2310, .
- Fiorenza, P., Iucolano, F., Nicotra, G., Bongiorno, C., Deretzis, I., La Magna, A., Giannazzo, F., Saggio, M., Spinella, C., Roccaforte, F.
Electron trapping at SiO₂/4H-SiC interface probed by transient capacitance measurements and atomic resolution chemical analysis (2018) *Nanotechnology*, 29 (39), art. no. 395702
- Fiorenza, P., Greco, G., Iucolano, F., Patti, A., Roccaforte, F.
Channel Mobility in GaN Hybrid MOS-HEMT Using SiO₂ as Gate Insulator (2017) *IEEE Transactions on Electron Devices*, 64 (7), art. no. 7927758, pp. 2893-2899.
- Fiorenza, P., La Magna, A., Vivona, M., Roccaforte, F.
Near interface traps in SiO₂/4H-SiC metal-oxide-semiconductor field effect transistors monitored by temperature dependent gate current transient measurements (2016) *Applied Physics Letters*, 109 (1), art. no. 012102.
- Fiorenza, P., Greco, G., Iucolano, F., Patti, A., Roccaforte, F.
Slow and fast traps in metal-oxide-semiconductor capacitors fabricated on recessed AlGaIn/GaN heterostructures (2015) *Applied Physics Letters*, 106 (14), art. no. 142903.
- Fiorenza, P., Frazzetto, A., Guamera, A., Saggio, M., Roccaforte, F.
Fowler-Nordheim tunneling at SiO₂/4H-SiC interfaces in metal-oxide-semiconductor field effect transistors (2014) *Applied Physics Letters*, 105 (14), art. no. 142108.

ADDITIONAL INFORMATION

Patrick Fiorenza received the M.Sc. in Physics and the PhD in Material Science from the University of Catania in 2003 and 2007, respectively. In 2005, he was visiting scientist at IMEC (Belgium). Since 2011 he is Researcher at CNR-IMM. His research activity is mainly focused on carrier transport, trapping phenomena and reliability at MIS and MS interfaces in SiC and GaN. He has a recognized experience in characterization of advanced materials and devices by scanning probe microscopy. He is co-author of 150 papers, three book chapters, and one international granted patent. He was involved in several European and national projects (NUOTO, NetFISiC, Last Power, Ambition Power). He is principal investigator for the CNR-IMM unit of the project AdvaSiC (2023-2025) within the Horizon Europe Since 2023. He was principal investigator for the CNR-IMM unit of the project GRIFONE (2015-2018) within the FlagERA call. Since 2018, he collaborates with European Commission Research Executive Agency as Project evaluator. He has been invited speaker at the 16th conference on Defect-Recognition, Imaging and Physics in Semiconductors (DRIP XVI 2015). He has been invited speaker at the 13th conference on *Expert Evaluation and Control of Compound Semiconductor Materials and Technologies* (EXMATEC XIII 2016). He has been invited speaker at the 12th conference on *European Conference on Silicon Carbide and Related Materials* (ECSCRM 2018). He holds a h-index of 30 (Google Scholar)

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Il D.Lgs 30/06/2003, n. 196 "Codice in materia di protezione dei dati personali" e il **GDPR (Regolamento UE 2016/679)** regolano il trattamento dei dati personali, con particolare riferimento alla riservatezza, all'identità personale e al diritto di protezione dei dati personali; l'interessato deve essere previamente informato del trattamento.

La norma in considerazione intende come "trattamento" qualunque operazione o complesso di operazioni concernenti la raccolta, la registrazione, l'organizzazione, la conservazione, la consultazione, l'elaborazione, la modifica, la selezione, l'estrazione, il raffronto, l'utilizzo, l'interconnessione, il blocco, la comunicazione, la diffusione, la cancellazione e la distruzione di dati, anche se non registrati in una banca dati.

Catania, February 17, 2023

Patrick Fiorenza

