

CURRICULUM VITAE

FORMATO EUROPEO/EUROPEAN FORMAT

PERSONAL INFORMATION

Name, Surname Giuseppe Greco
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Nationality Italian
Place and Date of birth Catania (Italy), November 30th 1982

WORK EXPERIENCE

From 01/02/2017 to now

Researcher of the CNR-IMM of Catania

Name and address of employer

Consiglio Nazionale delle Ricerche
Istituto per la Microelettronica e Microsistemi
Strada VIII, n. 5 – Zona Industriale
95121 Catania, Italy

Type of business or sector
Occupation or position held

Power Devices, Wide Band Gap Semiconductors, III-V heterostructures, HEMTs
Researcher

Main activities and responsibilities

Research activity and fields of interest:

- Ohmic and Schottky contacts to wide band gap materials (GaN, AlGaIn, SiC)
- Interfaces of dielectrics with GaN and AlGaIn for MOSHEMTs
- Processing approaches for normally-off HEMTs (recessed gate, p-GaN gate, etc.)
- Vertical Schottky diodes based on free-standing GaN
- Schottky contacts to different SiC polytypes
- Integration of 2D materials with III-V semiconductors

From 25/03/2013 to 31/01/2017

Post Doc at the Institute for Microelectronics and Microsystems of the National Research Council (CNR-IMM) of Catania, Italy

Name and address of employer

Consiglio Nazionale delle Ricerche
Istituto per la Microelettronica e Microsistemi
Strada VIII, n. 5 – Zona Industriale
95121 Catania, Italy

Type of business or sector
Occupation or position held

Power Devices, Wide Band Gap Semiconductors
Postdoctoral Research Fellow

Main activities and responsibilities

The research activity carried out during this period started with the objective to continue the work developed during the PhD. In particular, it has been focused on the possibility to engineer novel AlGaIn/GaN heterostructures, with the use of a specific cap layer (i.e., p-type GaN) in order to obtain normally-off AlGaIn/GaN HEMTs. I also investigated several issues that limit the use of HEMTs in applications (high leakage current, current collapse, critical breakdown). In this context, the use of dielectrics like NiO, CeO₂..., in HEMTs has been investigated and is still under evaluation. Moreover, near surface processes for AlGaIn/GaN heterostructures have been investigated in order to provide beneficial effects in HEMTs fabrication. Investigation on "Au-free" Ohmic contact on AlGaIn/GaN heterostructures is a central part of the research activity.

From 14/03/2010 to 24/03/2013

Scholarship at the Institute for the Microelectronics and Microsystems of the National Research Council (CNR-IMM) of Catania, Italy

Name and address of employer	Consiglio Nazionale delle Ricerche Istituto per la Microelettronica e Microsistemi Strada VIII, n. 5 – Zona Industriale 95121 Catania, Italy
Type of business or sector Occupation or position held	Power Devices, Wide Band Gap Semiconductors Ph.D student
Main activities and responsibilities	The main topic of my PhD thesis, carried out at the CNR of Catania, was the study of devices based on AlGaIn/GaN heterostructures, such as High Electron Mobility Transistors (HEMTs). In particular, my research activity was focused on the fabrication of normally-off AlGaIn/GaN HEMTs. Furthermore, the formation of Ohmic contacts on GaN and AlGaIn, including "Au-free" Ohmic contacts, was object of my research activity and the mechanisms of current transport at these metal/semiconductor interfaces were deeply investigated.
From 01/11/2009 at 10/01/2010	
Name and address of employer	Visiting Guest Scientist at the Institute of Nuclear Science, Ege University, Bornova, Izmir, Turkey. Institute for Nuclear Sciences Ege Üniversitesi Kampüsü 35100 Bornova, Izmir, Turkey.
Type of business or sector Occupation or position held	Environmental radiation Postgraduate student
Main activities and responsibilities	Several studies using on-line and on-site measurement systems have been carried out to evaluate the radioactivity coming from the ground in certain areas of western Turkey subjected to earthquake risks. During this period I acquired several skills about the environmental radioactivity and in particular on the radioactivity coming from the ground. I received also a training on the different techniques to measure the environmental radioactivity.
From 01/08/2008 at 31/07/2009	
Name and address of employer	Scholarship at the INFN – Laboratori Nazionali del Sud, Catania, Italy. INFN - Laboratori Nazionali del Sud, via S.Sofia 62, 95125 Catania, ITALY
Type of business or sector Occupation or position held	Photodetectors Master Thesis student
Main activities and responsibilities	The scholarship has been inserted in the context of the program RIACE (Accelerators and Detectors for Energy). In particular, the work was carried out under the project DMNR (Detector Mesh for Nuclear Depositories). The project was dedicated to the possibility to create a monitoring system for waste produced by nuclear reactors. The work carried out during this period was focused on the study and characterization of devices like single photon photomultipliers (SiPMs) for the monitoring of radioactive waste. The possibility to integrate these detectors with the scintillating fiber for the detection of radiation was also investigated. The activity was also awarded with a scholarship by Ansaldo Nucleare of duration of 1 year (1/09/2008 - 1/09/2009).
From 01/09/2005 at 20/11/2005	
Name and address of employer	Stage at the STMicroelectronics, Catania, Italy. STMicroelectronics Strada VIII, n. 5 – Zona Industriale 95121 Catania, Italy
Type of business or sector Occupation or position held	Electronic devices Bachelor Thesis student
Main activities and responsibilities	The stage in STMicroelectronics was made during the drafting of the three years thesis. During this stage I get access to various equipment and expertise for the study of lateral pnp transistors. Several knowledge of layout for the manufacture of electrical devices, knowledge of different techniques for electrical characterization and ability to use different equipment for electrical characterization have been acquired during this period.

EDUCATION AND TRAINING

26/02/2013	Ph.D Nanoscience Thesis: AlGaIn/GaN heterostructures for enhancement mode transistors Tutor: Prof. M.G. Grimaldi (University of Catania), Dott. F. Roccaforte (CNR-IMM of Catania). The work carried out during the Ph.D has been awarded by the "Accademia Gioienna of the University of Catania" with an award for young researcher in the field: "Recent research developments in the Physical Sciences".
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<p>Name and type of organization providing education and training</p> <p>Principal subjects occupational skills covered</p> <p>Title of qualification awarded</p> <p>Level in National classification</p>	<p>UNIVERSITY OF CATANIA,CATANIA, ITALY</p> <p>Material Sciences, Nanoscience, Wide Band Gap Semiconductors, III-V heterostructures, HEMTs</p> <p>Ph.D in Nanoscience</p> <p>Level 8</p>
<p>09/10/2009</p> <p>Name and type of organization providing education and training</p> <p>Principal subjects occupational skills covered</p> <p>Title of qualification awarded</p> <p>Level in National classification</p>	<p>M. Sc. Physics</p> <p>Thesis: AlGaIn/GaN heterostructures for enhancement mode transistors</p> <p>Tutor: Prof. G.V. Russo (University of Catania), Dott. P. Finocchiaro (INF-LSN of Catania), Dott. A. Pappalardo (INFN-LNS of Catania).</p> <p>UNIVERSITY OF CATANIA,CATANIA, ITALY</p> <p>Physics of Semiconductors, Electronics, Semiconductor devices, Material Sciences, Nuclear Physics</p> <p>M.A. in Physics (110/110)</p> <p>Level 7</p>
<p>22/11/2005</p> <p>Name and type of organization providing education and training</p> <p>Principal subjects occupational skills covered</p> <p>Title of qualification awarded</p> <p>Level in National classification</p>	<p>B.S Degree, Applied Physics</p> <p>Thesis: Characterization of lateral pnp transistor</p> <p>Tutor: Prof. G.V. Russo (University of Catania), G. Fallica (STMicroelectronics)</p> <p>UNIVERSITY OF CATANIA,CATANIA, ITALY</p> <p>Material Sciences, Nuclear Physics, Theoretical Physics Electronics, Physics, Numerical Analysis</p> <p>B.A. in Applied Physics (104/110)</p> <p>Level 6</p>

RESEARCH ACTIVITIES

Research sectors

Recent Scientific Activities.

Wide Band Gap semiconductors, GaN based device, Power Device Processing

My recent activity research is focused on wide band gap semiconductors (WBG), with a particular attention on GaN and related materials. A particular attention is devoted to the investigation of the mechanism of current transport of Schottky and Ohmic contact to WBG materials. The current activity is also focused to the physical and technological issues related to the fabrication of normally-off HEMTs, in particular with using of p-GaN/AlGaIn/GaN heterostructures or recessed approach. Moreover a part of the activity is also dedicated to vertical devices based on GaN. In the last years he focus also his interest also on the integration of 2D materials with WBG materials.

Books and Articles

Selected papers 2012-2018:

1. **G. Greco**, S. Di Franco, C. Bongiorno, E. Grzanka, M. Leszczynski, F. Giannazzo, F. Roccaforte, *Semicond. Sci. Technol.* 35, 105004 (2020).
2. M. Spera, **G. Greco**, R. Lo Nigro, S. Scalese, C. Bongiorno, M. Cannas, F. Giannazzo, F. Roccaforte, *Energies* 12, 2655 (2019).
3. F. Roccaforte, F. Giannazzo, A. Alberti, M. Spera, M. Cannas, I. Cora, B. Péc̄z, F. Iucolano, and **G. Greco**, *Mater. Sci. Semicond. Process.* 94, 164 (2019).
4. F. Roccaforte, P. Fiorenza, R. Lo Nigro, F. Giannazzo, , **G. Greco**, *Physics and technology of gallium nitride materials for power electronics*, *Rivista del Nuovo Cimento* 41(12), pp. 625-681 (2018)
5. **G. Greco**, F. Iucolano, F. Roccaforte, Review of technology for normally-off HEMTs with p-GaN gate, *Materials Science in Semiconductor Processing* 78, pp. 96-106 (2018).
6. **G. Greco**, F. Giannazzo, F. Roccaforte, *Temperature dependent forward current-voltage characteristics of Ni/Au Schottky contacts on AlGaIn/GaN heterostructures described by a two diodes model*, *Journal of Applied Physics*, 121, 045701 (2017).
7. F. Giannazzo, G. Fisichella, **G. Greco**, S. Di Franco, et al., *Ambipolar MoS2 transistors by Nanoscale Tailoring of Schottky Barrier Using Oxygen Plasma Functionalization*, *ACS Applied Materials and Interfaces*, 9 (27), pp. 23164-23174 (2017).
8. F. Roccaforte, P. Fiorenza, R. Lo Nigro, F. Giannazzo, , **G. Greco**, *Physics and technology of gallium nitride materials for power electronics*, *Rivista del Nuovo Cimento* 41(12), pp. 625-681 (2018)
9. **G. Greco**, F. Iucolano, F. Roccaforte, Review of technology for normally-off HEMTs with p-GaN gate, *Materials Science in Semiconductor Processing* 78, pp. 96-106 (2018).
10. **G. Greco**, F. Giannazzo, F. Roccaforte, *Temperature dependent forward current-voltage characteristics of Ni/Au Schottky contacts on AlGaIn/GaN heterostructures described by a two diodes model*, *Journal of Applied Physics*, 121, 045701 (2017).
11. **G. Greco**, F. Giannazzo, F. Roccaforte, *Temperature dependent forward current-voltage characteristics of Ni/Au Schottky contacts on AlGaIn/GaN heterostructures described by a two diodes model*, *Journal of Applied Physics*, 121, 045701 (2017).
12. F. Giannazzo, G. Fisichella, **G. Greco**, S. Di Franco, et al., *Ambipolar MoS2 transistors by Nanoscale Tailoring of Schottky Barrier Using Oxygen Plasma Functionalization*, *ACS Applied Materials and Interfaces*, 9 (27), pp. 23164-23174 (2017).
13. F. Giannazzo, G. Fisichella, A. Piazza, S. Di Franco, **G. Greco**, S. Agnello, F. Roccaforte, *Impact of contact resistance on the electrical properties of MoS2 transistors at practical operating temperatures*, *Beilstein Journal of Nanotechnology*, 8, 254-263 (2017).
14. P. Fiorenza, **G. Greco**, F. Iucolano, A. Patti, F. Roccaforte, *Channel Mobility in GaN Hybrid MOS-HEMT Using SiO2 as Gate Insulator*, *IEEE Transactions on Electr. Devices* 64, 2893-2899 (2017)
15. **G. Greco**, F. Iucolano, F. Roccaforte, *Ohmic contact to Gallium Nitride*, *Appl.Surf.Sc.* 383, 324-345 (2016) (*invited review paper*).
16. **G. Greco**, F. Iucolano, S. Di Franco, C. Bongiorno, A. Patti, F. Roccaforte, *Effects of annealing treatments on the properties of Al/Ti/p-GaN interfaces for normally OFF p-GaN HEMTs*, *IEEE Trans. Electron Dev.*, 63, 2735-2741 (2016).
17. **Greco**, F. Iucolano, C. Bongiorno, et al., *Electrical and structural properties of Ti/Al-based contacts on AlGaIn/GaN heterostructures with different quality*, *Phys. St. Sol. A*, 1-8 (2015).
18. P. Fiorenza, **G. Greco**, et al., *Slow and fast traps in metal-oxide-semiconductor capacitors fabricated on recessed AlGaIn/GaN heterostructures*, *Appl. Phys. Lett.* 106, 142903 (2015).
19. M. Vivona, **G. Greco**, R. Lo Nigro, C. Bongiorno, and F. Roccaforte, *Ti/Al/W Ohmic contacts to p-type implanted 4H-SiC*, *J. Appl. Phys.* 118, 035705 (2015).
20. **G. Greco**, F. Iucolano, M. Leszczynski, F. Roccaforte, et al., *Ti/Al ohmic contacts on AlGaIn/GaN heterostructures with different defect density*, *Appl.Surf.Sc.* 314 (2014) 546-551.
21. G. Fisichella, **G. Greco**, F. Roccaforte, F. Giannazzo, *Current transport in graphene/AlGaIn/GaN vertical heterostructures probed at nanoscale*, *Nanoscale*, 2014, 6, 8671-8680.
22. G. Fisichella, **G. Greco**, F. Roccaforte, F. Giannazzo, *From Schottky to Ohmic graphene contacts to AlGaIn/GaN heterostructures: Role of the AlGaIn layer microstructure*, *Appl. Phys. Lett.* 105, 063117 (2014).
23. **G. Greco**, P. Fiorenza, F. Giannazzo, A. Alberti, F. Roccaforte, *Nanoscale electrical and structural modification induced by rapid thermal oxidation of AlGaIn/GaN heterostructures*, *Nanotechnology* 25 (2), 025201 (2013).
24. **G. Greco**, F. Giannazzo, F. Iucolano, R. Lo Nigro, F. Roccaforte, *Nanoscale structural and electrical evolution of Ta- and Ti-based contacts on AlGaIn/GaN heterostructures*, *J. Appl. Phys.* 114 (2013), 083717.

More details on the publications of Dr. G. Greco are available at:

<https://www.scopus.com/authid/detail.uri?authorId=7101640316>

25. **H-index = 21 (source Scopus)**

Invited Talks

1. **Ohmic metallization for GaN based device**, presented at EXAMATEC (Expert evaluation and Control of Compounds of Semiconductor Materials and Technologies), 16-18 May 2018, Bucharest (Romania)
2. **2D materials integration with nitrides for high frequency applications**, presented at ETCMOS (Emerging Technologies Communications Microsistem Optoelectronics and Sensors), 9-11 May 2018, Whistler, BC (Canada)

Additional information

Awards

2015 Young Researcher Award of the "Accademia Gioiena of the University of Catania" in the field: "Recent research developments in the Physical Sciences", for the outstanding work carried out during the Ph.D.

Guest Editor of a Special issue in Materials Science in Semiconductor Processing (in press) entitled "New frontiers in wide-bandgap semiconductors and heterostructures for electronics, optoelectronics and sensing"

Organizer of a Symposium of the European Materials Research Society (EMRS) 2018 – Fall Meeting, Warsaw, Poland 17-21 September 2018

Referee activity

Experience of reviewing national projects for the Polish National Science Center (NCN) and the Slovak Research and Development Agency.

Catania, January 26th, 2023.

