

# CURRICULUM VITAE

FORMATO EUROPEO/EUROPEAN FORMAT

## PERSONAL INFORMATION

Name, Surname	Giuseppe Greco
Address	Via Della seta 20 Misterbianco (CT) 95045 ITALY
Telephone	0039 0955968243
Fax	---
E-mail	giuseppe.greco@imm.cnr.it
Website	<a href="https://hq.imm.cnr.it/">https://hq.imm.cnr.it/</a>
Nationality	Italian
Place and Date of birth	Catania (Italy), November 30 <sup>th</sup> 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	Power Devices, Wide Band Gap Semiconductors, III-V heterostructures, HEMTs
Occupation or position held	Researcher
Main activities and responsibilities	Research activity and fields of interest: <ul style="list-style-type: none"><li>▪ Ohmic and Schottky contacts to wide band gap materials (GaN, AlGaN, SiC)</li><li>▪ Interfaces of dielectrics with GaN and AlGaN for MOSHEMTs</li><li>▪ Processing approaches for normally-off HEMTs (recessed gate, p-GaN gate, etc.)</li><li>▪ Vertical Schottky diodes based on free-standing GaN</li><li>▪ Schottky contacts to different SiC polytypes</li><li>▪ Integration of 2D materials with III-V semiconductors</li></ul>

**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	Power Devices, Wide Band Gap Semiconductors
Occupation or position held	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 AlGaN/GaN heterostructures, with the use of a specific cap layer (i.e., p-type GaN) in order to obtain normally-off AlGaN/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, CeO <sub>2</sub> ..., in HEMTs has been investigated and is still under evaluation. Moreover, near surface processes for AlGaN/GaN heterostructures have been investigated in order to provide beneficial effects in HEMTs fabrication. Investigation on "Au-free" Ohmic contact on AlGaN/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
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Type of business or sector Occupation or position held	Istituto per la Microelettronica e Microsistemi Strada VIII, n. 5 – Zona Industriale 95121 Catania, Italy Power Devices, Wide Band Gap Semiconductors Ph.D student
	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.
Main activities and responsibilities	
<b>From 01/11/2009 at 10/01/2010</b>	<b>Visiting Guest Scientist at the Institute of Nuclear Science, Ege University, Bornova, Izmir, Turkey.</b>
Name and address of employer	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.
<b>From 01/08/2008 at 31/07/2009</b>	<b>Scholarship at the INFN – Laboratori Nazionali del Sud, Catania, Italy.</b>
Name and address of employer	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).
<b>From 01/09/2005 at 20/11/2005</b>	<b>Stage at the STMicroelectronics, Catania, Italy.</b>
Name and address of employer	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**

Name and type of organization  
providing education and training  
Principal subjects occupational skills  
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### 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*”.

UNIVERSITY OF CATANIA,CATANIA, ITALY

Material Sciences, Nanoscience, Wide Band Gap Semiconductors, III-V heterostructures,

covered  
Title of qualification awarded  
Level in National classification

HEMTs  
Ph.D in Nanoscience  
Level 8

09/10/2009

### M. Sc. Physics

Thesis: AlGaIn/GaN heterostructures for enhancement mode transistors  
Tutor: Prof. G.V. Russo (University of Catania), Dott. P. Finocchiaro (INF-LNS of Catania), Dott. A. Pappalardo (INFN-LNS of Catania).

Name and type of organization  
providing education and training  
Principal subjects occupational skills  
covered  
Title of qualification awarded  
Level in National classification

UNIVERSITY OF CATANIA, CATANIA, ITALY

Physics of Semiconductors, Electronics, Semiconductor devices, Material Sciences, Nuclear Physics  
M.A. in Physics (110/110)  
Level 7

22/11/2005

### B.S Degree, Applied Physics

Thesis: Characterization of lateral pnp transistor  
Tutor: Prof. G.V. Russo (University of Catania), G. Fallica (STMicroelectronics)

Name and type of organization  
providing education and training  
Principal subjects occupational skills  
covered  
Title of qualification awarded  
Level in National classification

UNIVERSITY OF CATANIA, CATANIA, ITALY

Material Sciences, Nuclear Physics, Theoretical Physics Electronics, Physics, Numerical Analysis  
B.A. in Applied Physics (104/110)  
Level 6

## 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. Péc, 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 MoS<sub>2</sub> 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 MoS<sub>2</sub> 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 SiO<sub>2</sub> 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 Microsystem Optoelectronics and Sensors), 9-11 May 2018, Whistler, BC (Canada)

#### Additional information

##### Awards

2015 Young Researcher Award of the "Accademia Gioienna 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, March 30, 2021.