

NAME : **ALEXANDROS GEORGAKILAS**

POSITION : *Professor*, Department of Physics, University of Crete, and
Faculty Member of the Microelectronics Research Group (MRG), Institute of Electronic Structure and Laser (IESL), Foundation for Research and Technology - Hellas (FORTH)

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Google Scholar : <https://scholar.google.com/citations?user=ec-2hsgAAAAJ>

EDUCATION : Ph.D. Physics, 1990, University of Crete, Heraklion, Greece
M.Sc. Physics, 1989, University of Crete, Heraklion, Greece
B.Sc. Physics, 1984, University of Patra, Patra, Greece
Lyceum Graduation Certificate, 1979, Mikto Lyceion Agiou Ierotheou, Peristeri, Attiki, Greece

PROFESSIONAL POSITIONS

5/2010 - *Professor*, Department of Physics, University of Crete, and
Faculty Member of the Microelectronics Research Group (MRG) of IESL, FORTH, Heraklion, Crete, Greece

10/2002- 5/2010 *Associate Professor*

9/1999- 9/2002 *Assistant Professor with tenure*

9/1995- 9/1999 *Assistant Professor*

10/1994-8/1995 *Research Associate*, MRG/IESL/FORTH, Heraklion, Crete, Greece

3/1993-9/1994 *Military service*, in Greek Airforce. The last 17 months were served at 126ΣΜ, Heraklion, Crete, Greece

10/1991-12/1992 *Visiting Research Scientist*, CALCE Electronic Packaging Research Center, Mechanical Engineering Department, College of Engineering, University of Maryland, College Park, MD 20742, USA

2/1989-2/1993 *Research Associate*, III-V Microelectronics Group, IESL, FORTH, Heraklion, Crete, Greece

2/1987 - 9/1987 *Visiting Research Assistant*, MBE laboratory, Thomson-CSF-L.C.R., Domaine de Corbeville, Orsay, France

9/1984-1/1989 *Research Assistant*, III-V Microelectronics Group, IESL, FORTH and/or
Teaching Assistant, Physics Department, Univ. Crete, Heraklion, Crete, Greece

PROFESSIONAL MEMBERSHIPS

- Institute of Electrical and Electronics Engineers (IEEE)
- Hellenic “MICRO & NANO” society

HONORS AND AWARDS

- Awarded by the Greek Foundation of Scholarships (IKY) (1980 and 1983)
- Graduate study scholarship by the Physics Dpt., Univ. Crete and IESL, FORTH, Greece (1984-1989)
- Received research scholarship by Thomson-CSF-LCR, Orsay, France (1987)

RESEARCH INTERESTS

Research in applied physics and materials science of advanced semiconductor materials and devices, with emphasis on:

- Molecular Beam Epitaxy (MBE) of novel III-V nanostructure-heterostructure materials for advanced electronic and optoelectronic semiconductor devices
- Development of technologies integrating III-V semiconductor devices on other substrates, such as Si
- Understanding the structural properties and their interrelation with the electronic properties of III-V semiconductor interfaces and thin films
- Understanding the material effects on the performance of III-V semiconductor devices

RESEARCH ACHIEVEMENTS

- He pioneered molecular beam epitaxy (MBE) in Greece. First PhD thesis on MBE in Greece, development of unique expertise in heteroepitaxy of III-V semiconductors on Si
- Principal Investigator in FORTH’s research team, which fabricated the first laser diodes in Greece using GaAs MBE material and demonstrated an optical interconnect technology on Si
- He initiated the research field of III-Nitride semiconductors at FORTH and UoC. He is a recognized expert of plasma-assisted MBE of III-Nitride semiconductors, especially for InN and In-containing III-Nitrides and the development of III-nitride HEMT materials. He has coordinated nationally funded projects for research on III-Nitride semiconductors aiming to develop MBE material and High Electron Mobility Transistors (HEMTs).

DEVELOPMENT OF RESEARCH INFRASTRUCTURE

Major accomplishments include:

- Purchase and installation of a Molecular Beam Epitaxy (MBE) system for the growth of III-nitride semiconductors (IESL, FORTH, 1997-1998)
- Purchase and installation of an AFM/STM microscope within the ΕΠΙΕΑΕΚ ΠΙΜΣ-MO graduate studies project (Physics Dept., UoC, 1998)
- Purchase and installation of a High Resolution X-ray Diffractometer (HRXRD) (Physics Dept., UoC, 2003)
- Purchase and installation of a Spectroscopic Ellipsometer (Physics Dept., UoC, 2006)
- Purchase and installation of a Semiconductor Parameter analyzer (Physics Dept. UoC, 2008)

OTHER PROFESSIONAL EXPERIENCE

- **Member in**
 - ✓ *Election committee of Research Institute Director:* 1 time
 - ✓ *Three-member committees for faculty evaluation or evaluator:* 15 times
 - ✓ *Faculty election board in Physics Dpt. of UoC:* many times
 - ✓ *Faculty election board outside Physics Dpt. of UoC:* 14 times

- **Co-chairman** of the “5th International Conference on Micro-Nanoelectronics, Nanotechnology and MEMS” (*MICRO & NANO 2012*), Kokkini Hani, Heraklion, Greece, October 7-10, 2012
- **Chairman**, «Σύγχρονες τεχνολογίες μικρο και νανο ηλεκτρονικής και η πράσινη εκδοχή», Τμήμα Φυσικής, Πανεπιστήμιο Κρήτης, Ηράκλειο, Κρήτη, 22-07-2011
- **Chairman** of the “19th European Heterostructure Technology Workshop” (*HETECH 2010*), October 18-20, 2010, Fodele, Crete, Greece
- **Co-chairman** of the “European Workshop on III-Nitride Semiconductor Materials and Devices”, Heraklion, Crete, Greece, September 18-20, 2006
- **Vice president** (2009-2012) and **elected member** (2007-2012) of the **governing board** of the Hellenic “MICRO & NANO” society
- **Reviewer/evaluator**
 - ✓ **Papers** of Advanced Materials, Applied Physics Letters, Applied Surface Science, Crystal Growth & Design, Diamond and Related Materials, International Journal of Nanotechnology, IEEE Electron Device Letters, IEEE Transactions on Electron Devices, IEEE Journal of the Electron Devices Society, Journal of Alloys and Compounds, Journal of Applied Physics, Journal of Crystal Growth, Journal of Vacuum Science and Technology A, Journal of Physics D: Applied Physics, Materials Science and Engineering B, Microelectronic Engineering, Nanoscale Research Letters, Optical Materials, Physica Status Solidi (a) and (b) and (c) and Letters, Semiconductor Science and Technology, Superlattices and Microstructures, Thin Solid Films, Vacuum, Proceedings of the Materials Research Society
 - ✓ **Research proposals** for the ENIAC JU and ECSEL JU (European), European Research Council (ERC), “General Secretariat for Research and Technology” (GSRT), Greece the “State Scholarships Foundation” (IKY), Greece and the “Engineering and Physical Sciences Research Council” (EPSRC), UK
 - ✓ **Project reviews** for the ENIAC JU and ECSEL JU (European)

PATENTS & PATENT APPLICATIONS

1. **Δίπλωμα Ευρεσιτεχνίας OBI, Αριθμός 1003602, Αθήνα 19 Ιουνίου 2001**, «*Διαδικασία ολοκλήρωσης, σε κλίμακα ακεραίων δισκίων ημιαγωγών, οπτοηλεκτρονικών ημιαγωγικών διατάξεων, βασισμένων σε Αρσενικούχο Γάλλιο και ολοκληρωμένων κυκλωμάτων Πυριτίου*», Γ. Χαλκιάς, Δ. Τσουκαλάς, Α. Γεωργακίλας
2. **European Patent Application EP1130647A2, 5/9/2001**, “*Procedure for the wafer scale integration of Gallium Arsenide based optoelectronic devices with silicon based integrated circuits*”, G.Halkias, D. Tsoukalas, A. Georgakilas
3. **Διπλ. Ευρεσιτεχνίας OBI, Αριθ. 1004675, Αθήνα 13/09/2004**, “*Ανάπτυξη με την μέθοδο Επίταξης με Μοριακές Δέσμες με Πηγή Πλάσματος Αζώτου ετεροδομών ημιαγωγών Νιτριδίων που περιλαμβάνουν στρώματα κραμάτων Νιτριδίου του Ινδίου-Αργιλίου-Γαλλίου*”, Α. Γεωργακίλας, Ε. Δημάκης, Ν. Πελεκάνος.
4. **Ελληνικής Αίτηση Διπλώματος Ευρεσιτεχνίας (OBI), Αριθμός Αίτησης: 20040100117(2-4-2004)**, «*Χρήση Ημιαγωγού Νιτριδίου του Γαλλίου (GaN) για την Ανίχνευση και Μέτρηση Αρνητικά Φορισμένων Ουσιών και Συσκευές Μέτρησης*», Ν. Χανιωτάκης, Ι. Αλιφραγκής, Γ. Κωνσταντινίδης και Α. Γεωργακίλας
5. **Δίπλωμα Ευρεσιτεχνίας OBI, Αριθμός 1008013, Αθήνα 22/10/2013**, «*Μέθοδος ετεροεπιταξιακής ανάπτυξης ΙΙΙ-Νιτριδίων, πολικότητας μετάπου-μετάλλου ΙΙΙ, πάνω σε υποστρώματα αδάμαντα*», Α. Γεωργακίλας, Κ. Αρετούλη και Κ. Τσαγκαράκη (Application no. 20120100227 at 25-4-2012)
6. **International (Patent Cooperation Treaty, PCT) Application, no. PCT/EP2013/058560 (24 April 2013)**, with publication number **WO/2013/160383 A1 (31 October 2013)** : “*Method for heteroepitaxial growth of III metal-face polarity III-Nitrides on substrates with diamond crystal structure and III-nitride semiconductors*», Α. Georgakilas, Κ. Aretouli and Κ. Tsagaraki

- a. **Application in European Patent Office** no. **EP13722321.0** (08 May 2015)
- b. **Application in United States Patent and Trademark Office**, no. **14/396,842** (October 24, 2014), with pub. no. US 2015/0144954 A1 (May 28, 2015) - Patent pending. Claims allowed with respect to polycrystalline diamond and AlN MBE

FUNDED RESEARCH PROJECTS

«Ετεροδομές βασισμένες στο InN για τρανζίστορ υπερυψηλών συχνοτήτων» - “InN based heterostructures for ultra-high frequency transistors”, **Greece-Slovakia bilateral** cooperation project, funded by GSRT, Greece (2012 - 2014)

Role: Principal investigator of FORTH Budget: 15,000 €

«Καινοτόμες νανο-ετεροδομές AlN και InN για τρανζίστορ υψηλής ευκινησίας» - “Novel AlN and InN nano-heterostructures for high electron mobility transistors”, **ΕΣΠΑ, ΑΡΙΣΤΕΙΑ** 1935, funding by Hellenic Ministry of Education (28/9/2012-27/9/2015)

Role: Project’s coordinator & principal investigator of FORTH Budget: 464.000 €

«Αυθόρμητη ανάπτυξη, ιδιότητες και διατάξεις νανοημάτων των ημιαγωγών III-V» - “Spontaneous growth, properties and devices of III-V semiconductor nanowires”, **ΕΣΠΑ, ΘΑΛΗΣ** MIS 377284, funding by Hellenic Ministry of Education (1/1/2012-30/9/2015)

Role: Project’s coordinator & principal investigator of UoC Budget: 600.000 €

“Materials for Robust Gallium Nitride” (MORGaN), **Nanosciences, Nanotechnologies, Materials and New Production Technologies (NMP) Large scale integrating project**, Grant agreement no: 214610, funding by EU (11/2008 – 10/2011)

Role: Principal investigator of FORTH Budget: 694,918 €

«Μελέτη προηγμένων φωτοβολταϊκών στοιχείων βασισμένων στην τεχνολογία των κραμάτων InGaN-Στο δρόμο για την επίλυση του ενεργειακού προβλήματος του πλανήτη μας», **ΕΡΥΑΝ/0506/04**, χρηματοδοτείται από το «Ίδρυμα Προώθησης Έρευνας» (ΙΠΕ) Κύπρου (29/12/2006-28/8/2010)

Role: Principal investigator of UoC Budget (UoC): 19,260 CYP (24,705€) funding

“InAlN/(In)GaN Heterostructure Technology for Ultra-high Power Microwave Transistor” (ULTRAGAN), **IST STREP Contract no. FP6-006903**, funding by EU (1/9/2005- 31/10/2008)

Role: Principal investigator of FORTH Budget: 580,906 € (FC)

“Interfacial phenomena at atomic resolution and multiscale properties of novel III-V semiconductors” (PARSEM), **MRTN-CT-2004-005583**, funding by EU (1/3/2005- 28/2/2009)

Role: Principal investigator of FORTH Budget: 237,864.20 € (AC)

«Περιφερειακός Πόλος Καινοτομίας Κρήτης (I4CRETE) - Ενέργεια A12: Βιομηχανικές Εφαρμογές Μικροηλεκτρονικών Συστημάτων», χρηματοδοτείται από ΓΓΕΤ (1/11/2006-31/10/2008)

Role: Principal investigator of UoC Budget (UoC): 49,183.8 €

«Ανάπτυξη μικροσυστημάτων βιοαισθητήρων για τηλεμέτρηση τοξικών ουσιών», **ΠΕΝΕΛ 03ΕΛ436**, χρηματοδότηση από ΓΓΕΤ. (1/12/2005-30/11/2008).

Role: Scientific responsible of the team of Physics Dpt. with funding for one Ph.D. student.

«Τεχνολογία και ιδιότητες τρανζίστορ τύπου MOS HFET GaN με μονωτή υψηλής διηλεκτρικής σταθεράς», **Greece-Slovakia bilateral** cooperation project, funded by GSRT, Greece (2005 - 2007)

Role: Principal investigator of FORTH Budget: 11,740 €

“Ανάπτυξη και Ιδιότητες Νέων Ημιαγωγικών III-V Ετεροδομών-Νανοδομών”, **ΠΥΘΑΓΟΡΑΣ**, funding by Hellenic Ministry of National Education and Religious Affairs (1/3/2004-31/8/2006)

Role: Principal investigator of UoC Budget: 80,000 €

“New Generation of GaN-based sensor arrays for nano- and pico-fluidic systems for fast and reliable biomedical testing” (GaNano), **NMP-2002-505641-1**, funding by EU (2004-2006)

Role: Principal investigator of Univ. Crete Budget: 269,000 € (AC)

«Ανάπτυξη προηγμένων υλικών και διατάξεων με βάση τον νέο ημιαγωγό νιτρίδιο του γαλλίου (GaN) για μικροκυματικές εφαρμογές» (ΠΡΟΝΙΤΡΟ), **ΠΕΝΕΑ 01ΕΑ583**, funding by General Secretariat of Research and Technology (GSRT), Ministry of Development, Greece and INTRACOM S.A. (1/4/2003-31/3/2006).

Role: Project's coordinator & principal investigator of UoC

Budget: 117,388 €

«Ημιαγωγικές οπτοηλεκτρονικές διατάξεις εκπομπής υπεριώδους φωτός» (ΕΚΠΟΜΠΗ UV), **ΠΕΝΕΑ 01ΕΑ481**, funding by General Secretariat of Research and Technology (GSRT), Ministry of Development, Greece and Compite S.A. (1/6/2003-31/5/2006).

Role: Principal investigator of UoC

Budget: 50,310 €

"Improvements in the epitaxial growth and processing of GaN-based HFET transistors", **Greece-Slovakia bilateral** cooperation project, funded by GSRT, Greece (2002 - 2003)

Role: Principal investigator of FORTH Budget: 12,326 Euro

"Microwave Monolithic Integrated Transmitted Power Sensors and Their Industrial and Metrological Applications", **NATO SFP 974172**, funded by NATO and GSRT (12/1999-12/2003).

Role: Project's coordinator & principal investigator of Univ. Crete in the period 12/1999-12/2001.

Budget: 10,900,000 BEF (total), Univ.Crete: 2,000,000 BEF + 4,800,000 GRD

"Technology and characterization of GaN-HFET devices", **Greece-Germany bilateral** cooperation project, funded by GSRT, Greece (15/10/99-15/10/2001).

Role: Principal investigator of FORTH Budget: 4,200,000 GRD (12,325.8 €)

"Physics and Technology of GaN Heterostructure Field Effect Transistors (GANFET)", **ΠΕΝΕΑ 99ΕΑ 320**, funding by General Secretariat of Research and Technology (GSRT), Ministry of Development, Greece (1/1/2000-30/6/2001).

Role: Project's coordinator & principal investigator of FORTH Budget: 57,000,000 GRD (167,278)

"Bonding Technology for Monolithic Integration of GaAs Optoelectronic Devices on Si Substrates for chip-to-chip Optical Interconnections (BONTEC)", **ESPRIT 28998**, funded by EU (1/9/1998-31/12/2000).

Role: Principal investigator of FORTH Budget: 360,000 € (full cost)

"Fabrication technology and physics of GaN MSM photodetectors", **Greece-Slovakia bilateral** cooperation project, funded by GSRT, Greece (12/10/1998 - 12/4/2001)

Role: Main researcher, collaborating with the PI Budget: 3,255,000 GRD (9,552.4 €)

"Lateral mode behaviour of long, low confinement high power laser diodes", **Greece-Romania bilateral** cooperation project, funded by GSRT, Greece (5/12/1997-5/3/2000).

Role: Principal investigator of FORTH Budget: 3,045,000 GRD (8,936,2 €)

"Investigation of the heteroepitaxial growth of semiconductors with High Resolution X-Ray Diffraction", **ΠΕΝΕΑ No. 1069** of Univ. Athens, funded by GSRT, Greece (1/7/1997-30/6/1999).

Role: Collaborator to Univ. Athens Budget: ~ 3,000,000 GRD (8,804.1 €) (U. Crete)

"Fabrication of novel and reliable InGaAs/InAlAs power HFET transistors on InP", **ΠΕΝΕΑ No. 847**, funded by GSRT, Greece (1/5/1996-30/6/1999).

Role: Principal investigator of FORTH Budget: 8,000,000 GRD (23,477.6 €)

"Failure Analysis of InGaAs/InAlAs HFETs", **Greece-Spain bilateral** cooperation project, funding by GSRT, Greece (6/3/97-15/10/99).

Role: Principal investigator of FORTH Budget: 2,100,000 GRD (6,162.9 €)

"Advancement of the Molecular Beam Epitaxy (MBE) infrastructure for growth of nitrides", **EPET II** for improvement of the research infrastructure of IESL/FORTH, funded by GSRT, Greece (17/6/96-17/6/98).

Role: Principal investigator of IESL Budget: 200,000,000 GRD (586,940.6 €)

"Analysis of crystal defects in the GaAs/Si interface and GaAs-on-Si thin films by Transmission Electron Microscopy", **ΠΕΝΕΑ No. 1623** of Univ. Thessaloniki, funded by GSRT, Greece (1/6/1996-31/7/1998).

Role: Collaborator to Univ. Thessaloniki, principal investigator of FORTH / Univ. Crete

Budget: ~ 1,500,000 GRD (~4,402 €) (Crete)

"Silicon Substrates for MBE-GaAs epi Layers (SISGAL)" **ESPRIT 9500** (German Special Action "New Federal States" IMPROVE), Subproject No. 19, funded by EU (5/12/93-5/12/95).

Role: Main researcher, assuming all duties of FORTH's principal investigator

Budget: 120,000 € (additional cost)

"Clustering and Ordering Phenomena in Molecular Beam Epitaxial Semiconductor Alloys", **Greece-Spain bilateral** cooperation project, funded by GSRT, Greece (1/1/94-31/12/95).

Role: Principal investigator of FORTH Budget: 1,400,000 GRD (4,108.6 €)

EDUCATIONAL ACTIVITIES & RESEARCH SUPERVISING

- Director of the Graduate Studies Program "Photonics and Nanoelectronics" of the Physics Department, University of Crete (2017-)
- Member of the Undergraduate and Graduate Program Committees of the Physics Department, UoC
- Member of the Graduate Programs Committee of the University of Crete (2014 - 2017)

Development of the Postgraduate Studies Program in "Microelectronics-Optoelectronics" (ΠΙΜΣ-MO) / "Photonics and Nanoelectronics" (ΠΙΜΣ-ΦΩΝΗ)

Following his faculty appointment to the Univ. Crete he worked, together with senior colleagues of MRG, for the preparation of a microelectronics graduate school. This materialized in 1998 as a joint program in microelectronics and optoelectronics, in collaboration with other divisions of the Physics Dpt./Univ. Crete and IESL/FORTH, after submitting a successful common ΕΠΕΑΕΚ proposal to the Ministry of Education

- Participated in the funded ΕΠΕΑΕΚ project (1997-2000) for the development of the "Graduate Program in Microelectronics-Optoelectronics" (ΠΙΜΣ-MO) with duties including:
 - ✓ Member of the project's "coordination committee"
 - ✓ Chairman of the "committee for equipment purchases"
- In 2014, ΠΙΜΣ-MO was renamed as "Postgraduate Studies Program in Photonics and Nanoelectronics" (ΠΙΜΣ-ΦΩΝΗ). A.G. continues academic involvement in the semiconductors' part of ΠΙΜΣ-ΦΩΝΗ as:
 - ✓ Teacher of graduate courses, including one of the 3 obligatory
 - ✓ Member of its "academic program coordinating committee" (Συντονιστική Επιτροπή Σπουδών)
 - ✓ Director since 2017

Courses taught at Physics Dpt., Univ. Crete

- *"Introduction to Microelectronics" / "Introduction to Semiconductor Devices"*, undergraduate level
- *"Semiconductor Laboratory" / "Semiconductor Physics Laboratory"*, graduate level
- *"Electronic Devices I" / "Physics of Semiconductor Devices"*, graduate level (obligatory course of the Graduate Studies Program in Nanoelectronics and Photonics)
- *"Semiconductor Optoelectronic Devices"*, graduate level
- *"Thin Film Science in Electronics"*, graduate level
- *Lectures* about semiconductors in the undergraduate course *"Topics of Modern Physics"*
- *Short courses* in the regular *"Summer School of Advanced Physics"*, organized by the Department of Physics, UoC and IESL/FORTH in Heraklion (1996, 1998, 2000, 2011)

Other teaching

- *"MMIC Failure Analysis Techniques"*, 5th Session of the NTU Satellite Network Course, No. MC920825B1: "Reliability of Gallium Arsenide Microwave Integrated Circuits" August 25-26, 1992, College Park, Maryland, USA

- *Teaching assistance* during 1984-1998 at Physics Dpt., UoC in the courses: Physics I-Mechanics (problems), Electricity Laboratory, Physics of Electronics (laboratory), Electronic Circuits (laboratory) and Advanced Laboratory of Physics

Supervising as a Faculty member of Physics Dpt., Univ. Crete

- Supervised Ph.D. theses:
 - ✓ “Spontaneous and selective growth of GaN nanowires on Si(111) substrates by molecular beam epitaxy” (Dec 2018)
 - ✓ “AlN and InN HEMT technology for high power and high frequency applications” (March 2018)
 - ✓ “Molecular beam epitaxy of the GaN semiconductor on diamond and r-plane sapphire substrates” (Dec 2011)
 - ✓ Epitaxial growth and properties of InN heterostructures-nanostructures” (June 2011)
 - ✓ “Molecular beam epitaxy of (In)AlN/GaN heterostructures for high electron mobility transistors” (Jan 2009)
 - ✓ “Physical mechanisms of molecular beam epitaxy and properties of InN (0001) thin films”, Jan 2007)
 - ✓ “Development and study of GaN HFET devices for application in chemical sensors” (Jan 2007)
 - ✓ Also supervised work on multiple quantum well and etched-mirror lasers included in a PhD thesis at Univ. Bucharest (2002)
- Member of three-member Ph.D. supervising committees: 4
- M.Sc. students: 18
- Research training - internships
 - ✓ Undergraduate students of Univ. Crete, Univ. Athens, E.N.S. de Physique de Grenoble, Technical University of Ilmenau
 - ✓ Graduate students of Univ. Bucharest
- Post Doctoral and visiting Research Associates: 8

RESEARCH PUBLICATIONS

ResearcherID : <http://www.researcherid.com/rid/G-7944-2011>

Total Articles in Publication List: 163
Articles With Citation Data: 163
Sum of the Times Cited: 2085
Average Citations per Article: 12.79
h-index: 25
Last Updated: 12/17/2018 19:25 GMT

BOOK CHAPTERS: 2

GUEST EDITOR: 1

INVITED PAPERS & TALKS IN CONFERENCES-WORKSHOPS: 24