

# XXXVI Ciclo

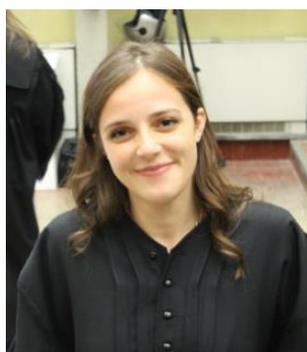
Cali' Federico



Federico Cali graduated in Materials Chemistry at the Department of Chemical Sciences of the University of Catania in 2020, with an experimental thesis entitled "Models and Methods for Molecular Communication through microfluidic channels". Currently, he is a PhD student in the Doctoral School in Materials Science and Nanotechnology. His research focuses on modeling and optimization of methods for molecular communication under microfluidic conditions and using carbon nanoparticles. In addition to molecular communication, he is also interested in the study of materials and systems for applications in the agri-food sector.

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Di Mari Gisella



Gisella Di Mari was born in 1992 in Catania, Italy. She attained her Master Degree in Materials Chemistry with marks 110/110 cum laude from the University of Catania in October 2019. In November 2020 she started the Ph.D. course in Materials Science and Nanotechnology at the University of Catania. She is currently working at the Department of Physics and Astronomy, University of Catania, and at CNR-IMM. Gisella Di Mari's main scientific interests are focused on the synthesis of nanostructured semiconductors through Chemical Bath Deposition (CBD) with environmental applications, like bioplastics. In particular her research activity deals with the

synthesis of Zinc Oxide nanostructures, differently shaped as a function of the process parameters, and their influence into the plastic performances.

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## Giuffrida Federico



Federico Giuffrida was born in 1995 in Catania, Italy. He obtained his master's degree in chemistry of Materials with final mark 110/110 at University of Catania, in November 2019. In November 2020 he started a Ph.D course in Materials Science and Nanotechnologies at University of Catania. Federico Giuffrida's main scientific interest is about the synthesis and characterization of TiO<sub>2</sub> nanowires (NWs) and the study of their photocatalytic properties.

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## Lo Presti Francesca



Francesca Lo Presti graduated in Materials Chemistry at the University of Catania [UNICT] in 2020, with an experimental thesis regarding "Synthesis and Characterisation of Barium Fluoride Thin Films doped with Luminescent Elements for Energy Conversion Applications" with tutors Prof. Graziella Malandrino and Dr. Anna Lucia Pellegrino. In November 2020 she started her PhD in Materials Science and Nanotechnology within the same research group. Her research project

focuses on the synthesis, engineering and characterisation of new single precursors defined as 'third generation precursors' for vapour deposition and solution processes. In addition, she is currently working on the synthesis and characterisation of Metal-Organic Frameworks doped with luminescent ions.

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## Salemi Luca



I am a physicist with a strong background in semiconductor photonics devices and simulations. I obtained my Master's Degree at Università di Pisa working on waveguide engineering, cleanroom fabrication, and characterization of terahertz quantum cascade lasers. Currently I am a Ph.D. student at Università degli studi di Catania in the course of Materials Science and Nanotechnology. My current research interest is in the plasmonics of noble metal nanoparticles and their application in the fields of sensing and photonics. At Università di Catania I seek to complement my skills in photonics and simulations by collaborating with the colleagues at the Department of Chemistry, combining prediction and engineering of the behaviour of plasmonics systems with control over the material synthesis, manipulation and functionalization, in order to gain a deeper understanding of their working principle and develop new applications.

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## Vecchio Daniele



I am a physicist with a master's degree in condensed matter physics and my activity is focused on silicon carbide. As a process engineer at STMicroelectronics, I am interested in developing and improving the morphological and electrical features of 4H-SiC epitaxial growth on wafers for power electronics applications. Currently, my efforts go towards a deeper understanding of crystallographic defects, both point and extended ones, using different optical and electrical characterization techniques.

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**Bonanno Angelo**

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# XXXV Ciclo

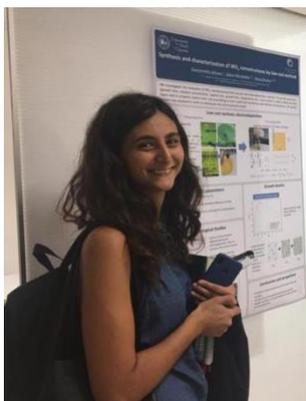
Bruno Luca



Luca Bruno was born in 1994 in Catania, Italy. He attained his Master's Degree in Physics with marks 110/110 cum laude from the University of Catania in October 2019. In November 2019 he started the Ph.D. course in Materials Science and Nanotechnology at the University of Catania. He is currently working at the Department of Physics and Astronomy, University of Catania, and at CNR-IMM. Luca Bruno's main scientific interests are focused on the low-cost synthesis and decoration with mono- and bimetallic nanoparticles (Au, AuPd, AuPt) of nanostructured metal oxide semiconductors (nickel oxide, zinc oxide,...) for sensing and electrochemical applications and on the research of a low-cost Ni-based catalyst for energy applications.

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Mineo Giacometta



I am Giacometta Mineo and I am a PhD Student in Materials Science and Nanotechnology XXXV cycle at the University of Catania. I obtained my degree in Physics in 2019, and my interests are mainly focused on Condensed Matter Physics and in its various aspects, ranging from atomic physics to solid-state physics, and nanotechnologies. In particular, my studies currently converge on synthesis of tungsten trioxide nanostructures and investigation of their properties. Within my group, we studied different synthesis technique such electrodeposition and hydrothermal synthesis

for tungsten trioxide nanostructures production, we investigated the interaction at the base of H<sub>2</sub> sensing mechanism, and we tested electrochemical properties of tungsten trioxide in order to realize supercapacitors for energy storage applications.

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## Micali Melanie



Melanie Micali was born in 1993 in Catania, Italy. She attained her Master Degree in Physics from University of Catania in July 2019. In November 2019 she started the Ph.D. course in Materials Science and Nanotechnology at the University of Catania. She is currently working at the Department of Physics and Astronomy, University of Catania, and at CNR-IMM. Melanie Micali's main scientific interests are focused on the synthesis and characterization of high efficiency transparent and flexible electrodes for ICT and photovoltaic applications. In particular, highly conductive Indium based transparent conductive oxide thin films doped with transition metals proposed as alternatives TCO for large industrial scale.

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## Chiechio Regina Maria



Regina Maria Chiechio was born in 1993 in Catania, Italy. She obtained her Master Degree in Condensed Matter Physics and Nanomaterial, pathway Nanosciences, Nanomaterials and Nanotechnologies with marks 110/110 cum laude from the University of Rennes 1, France, in June 2019. In November 2019 she started the Ph.D. course in Materials Science and Nanotechnology at the University of Catania in co-tutelage with the University of Rennes 1. She is currently working at the Department of Physics and Astronomy, University of Catania, and at CNR-IMM. Regina Maria Chiechio's main scientific interests are focused on the synthesis, characterisation and application of fluorescent nanostructures for bioimaging and biosensing, in particular on the chemical synthesis and functionalisation of luminescent gold nanoclusters and lanthanide-doped nanoparticles for pancreatic tumor cells and extracellular vesicles labelling.

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Cannizzaro Annalisa:



Silicon Carbide (SiC) can be proposed as an alternative to Silicon to improve the power of the electrical devices and reduce the electricity consumption, in all areas of electronics. My research activity is promoted by the “CHALLENGE” project (included in the Horizon-2020 program), whose aim is to develop cubic Silicon Carbide (3C-SiC) hetero-epitaxially grown on silicon compliance

substrates, for sustainable wide band-gap power device. In particular, I study how different patterned substrates can affect the density of anti-phase boundary (APB) defects, as a function of various SiC thickness deposition. Characterizations of several samples, different for thicknesses of SiC growth on different patterned substrates, are performed by means of scanning and transmission electron microscopy (SEM and TEM), taking care to prepare good samples for electron microscopy observations. These analyses provided values of APB densities for each sample, allowing to elaborate a phenomenological model concerning the growth and evolution of APBs, as a function of SiC thickness and substrate geometry.

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## Meli Alessandro



Alessandro Meli has a master's degree in materials chemistry. After a series of work experiences, at STMicroelectronics and CNR-IMM, he started the doctoral course in materials science and nanotechnology, with a scholarship of ENI S.p.A. and in collaboration with CNR-IMM headquarter and INFN of Catania. The focus of the actual research is the study of Silicon Carbide (SiC) properties for power devices and particles detection applications, in particular for neutron detection in a thermonuclear reactor. SiC is a compound semiconductor which is considered as a possible alternative to silicon for particles and photon detection. Its characteristics make it very promising for the next generation of nuclear and particle physics experiments where the temperature and the radiation environment preclude the use of conventional microelectronic semiconductors. This study evolved from epitaxial growth on 4H-SiC substrates and related characterizations, up to continuing with the design and fabrication of the devices. The prototypes obtained will then be tested both electrically and with a neutron beam in order to simulate the operating conditions.

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## Pizzone Mattia



Mattia Pizzone è il vincitore di una borsa di dottorato industriale co-finanziata da CNR ed STMicroelectronics. I suoi interessi scientifici comprendono tecniche innovative di drogaggio su silicio (Si) e carburo di silicio (SiC). In particolare la sua attività scientifica riguarda il doping molecolare, una tecnica innovativa di drogaggio che utilizza molecole come mezzo per il trasporto di impurità sulla superficie del semiconduttore che, una volta iniziato il processo di drive-in, si scindono liberando il drogante e permettendone la diffusione all'interno della matrice del semiconduttore. La sfida principale del suo percorso di dottorato riguarda l'applicazione della tecnica al SiC e alle sue nanostrutture, notoriamente difficili da trattare con processi simili.

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## Pulvirenti Luca



The research activity of Luca Pulvirenti is focused on the preparation of functional material through the surface modification of ferrites. It can be divided in two lines: synthesis of materials for: a) environmental and b) biomedical applications. Luca uses the photocatalytic properties of bismuth ferrite to degrade organic molecules that cannot be removed with classical removal methods while we will use the organic coating based on cavitands for the selective removal of pollutants (heavy metals and organic pollutants) present in traces in waste water. Luca is working on the development of two different materials in the treatment of wastewater and in anti-cancer therapies. As for

wastewater, he is using the same inorganic core used for the treatment of pollutants, but with a different organic coating, in order to more effectively remove the bacteria that are often present in wastewater. For the second use, he is using the intrinsic biocompatibility and low toxicity properties of magnetite to design nanocomposites for drug delivery application with the aim of designing carriers that are able to protect anti-cancer drugs during the delicate passage of overcoming cell barriers.

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## Panasci Salvatore Ethan



My scientific interests cover the aspects related to the preparation and characterization of two-dimensional materials as Graphene and Transition Metal Dichalcogenides (2D TMDs) for micro and nanoelectronics applications. During my first two years as PhD student, I used a method developed by several groups in recent years defined “Mechanical exfoliation assisted by gold” by which is possible to prepare large area monolayers TMDs with high crystal quality. I also characterized these samples from morphological, electrical, vibrational and optical point of view by Atomic Force Microscopy (AFM), Conductive AFM, Raman and Photoluminescence Spectroscopy respectively. In addition, thanks to the ETMOS project collaborations, I characterized other 2D materials realized by Chemical Vapour Deposition (CVD), Molecular Beam Epitaxy (MBE) and Pulsed Laser Deposition (PLD). From these characterizations I learned to distinguish their electrical and optical differences even when integrated with wide-band gap materials (SiC and GaN).

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## Pulvirenti Mario



I am Mario Pulvirenti PhD student in material sciences and nanotechnology. I have Master's degree in chemistry of materials, obtained at University of Study of Catania. My doctoral activities and scientific interests are focused on synthesis and characterization of noble metal nanomaterials, having peculiar plasmon resonance properties. I am studying nanomaterial based on silver and gold which are the most interesting chemical species due to their strong plasmon properties. These nanoparticles are useful in many research fields as sensors, photo- catalysis and photovoltaic. Currently I am developing a specific sensor based on plasmon resonance and new methods to functionalize materials with silver and gold nanoparticles to create specific sensor substrates.

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## Leonardi Marco



I am Marco Leonardi and I am a chemist. I deal with silicon photovoltaic technologies and the development of solutions to produce green fuels. I spent the last year characterizing silicon heterojunction bifacial solar cells and testing them in outdoor conditions in collaboration with the National Research Council and Enel Green Power. Furthermore, I have followed the design and realization of a water-splitting demonstrator made up of Silicon solar cells and a Polymer Exchange Membrane electrolyser that perfectly worked for six months. I am currently testing 4-terminal photovoltaic solutions based on Si and III-V semiconductors, e.g. GaAs, to increase modules' efficiency. In addition, I am working on ammonia production via electrochemical nitrogen reduction by using a no-noble metal catalyst.

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Valastro Salvatore



My research interest focuses on Perovskite materials for thin-film Photovoltaic applications. It mainly relies on the interface coupling of the Perovskite absorber (e.g. MAPbI<sub>3</sub>) with the adjacent transporting layers (e.g. oxides) for the optimization of carrier extraction and transport in Perovskite Solar Cells. Special care is devoted to the stability of the device performances which is evaluated by electrical characterization under solar simulator over time (durability and ageing). As a step beyond, my research activity aims at investigating structure and stability of innovative Perovskites (e.g. CsPbI<sub>3</sub>, FASnI<sub>3</sub>) through the evolution of their optical and structural properties by in-situ advanced characterizations under controlled environment and temperature conditions.

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# XXXIV Ciclo

Fichera Luca



Luca Fichera received his master's degree in materials chemistry at the University of Catania in 2018 with a thesis entitled “Mathematical models for molecular communication”. He is a Ph.D. candidate, under the supervision of Prof. Tuccitto, with a focus on research on the use of carbon nanoparticles in molecular communication. In addition to molecular communication, his interests focus on the electrical characterization of organic semiconductors and the study of their sensor properties.

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Morganti Dario



The experimental activity I have followed during my PhD is focused in the general research sector of the science and technologies of silicon nanostructures. In particular I deal with the realization and application of luminescent silicon nanowires, synthesized through a metal-assisted chemical-etching process. The particular morphological, optical, and electrical properties of these nanowires have proved to be a winning attribute in the environmental and biological sensor field. In particular, I realized two sensors based on the Si nanowires luminescence quenching for the

detection of very low nitrogen dioxide concentrations and for the isolation and quantification of exosomes. Another interesting application involve the realization of a new hybrid antenna system for the transfer of light energy, based on silicon nanowires and dyes. The dyes used belong to the class of Ru(II) and Os(II) polypyridine dendrimers, which I synthesized and studied at the University of Messina during my degree course. Currently, my interest is aimed at studying and characterizing this on Si nanowires-based platform with different dyes emitting in the infrared and in the realization of even more sensitive and selective sensors towards different chemical species

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## Stefania Pascuale



L'attività di ricerca è incentrata sulla fisica applicata ai beni culturali e nello specifico sulla produzione e sulla caratterizzazione di materiali nanostrutturati per la conservazione e il restauro di opere policrome. In particolare, lo studio è focalizzato sulla produzione, tramite Pulsed Laser Ablation in Liquids, di nanoparticelle di biossido di titanio che, grazie alle loro proprietà, si prestano a applicazioni con finalità protettive e di self-cleaning su stesure pittoriche.

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## Pellegrino Domenico

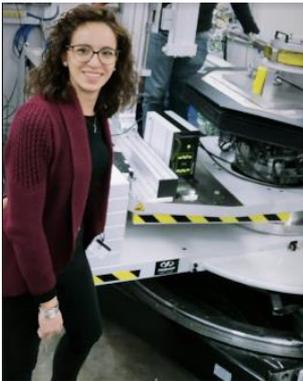


The silicon carbide (SiC) is a wide bang gap semiconductor, more promising for the devices operating in hostile environment such as that radiation rich. My Ph. D work concerns the effects of ion irradiation on SiC based p-n junction diodes. The goals of my work are the study of the

radiation induced point defects in n- type 4H-SiC and their evolution as well as the study of the radiation induced changes in the SiC p-n junction electrical properties.

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## Ruffino Roberta



Roberta Ruffino received her master's degree in materials chemistry at the University of Catania in 2018 with a thesis entitled “Nano-curvature and self-organization of semicrystalline polymers at surfaces”. Currently, she is a Ph.D. student in the Doctoral School in Materials Science and Nanotechnology under the supervision of prof. G. Marletta. Her research focuses on the nanostructuring and self-assembly of soft materials at solid and liquid interfaces via cutting-edge methodologies including synchrotron-based techniques.

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## Sciuto Alberto



My current scientific interest is focused on Laser Annealing simulations using Finite Element Methods in challenging situations. The main focus is with nanometer structures that requires phonon transport corrections to heat transport, 2D

simulations of Explosive Crystallization and recently multiscale simulations when we consider the physics at the nanoscale coupled with the physics at the "Wafer scale".

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## Valenti Andrea Maria Gerardo



Since my bachelor thesis and master's thesis, I have dealt with the functionalization of oxide surfaces and their 2-D and 3-D characterization using ToF-SIMS as a key tool. Presently, during my Ph.D. project, I am further exploring aspects related to the ToF-SIMS depth profiling of self-assembled hybrid supramolecular architectures grown on different types of inorganic oxides in order to investigate their 3-D structure. I also deal with big data treatment for ToF-SIMS 3-D imaging.

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## Castorina Silvia

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