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SAMMAR TAYYAB

Email address: sammar.tayyab@uniroma1.it

EDUCATION AND TRAINING

Doctor of Philosophy in Mathematical Models for Engineering, Electromagnetism and Nanoscience.

Sapienza University of Rome (Sapienza Università di Roma) [01/10/2021 – 23/01/2025]

City: Rome | **Country:** Italy | **Website:** https://www.uniroma1.it/it/ | **Field(s) of study:** Physics of condensed matter, Surfaces and low dimentional structures, Nanosystems.

In my PhD work, I studied and characterized Highly aligned Multi-walled Carbon nanotubes (MW-CNTs), in their pristine state and after functionalization. The samples were studied after annealing and after plasma treatment during their synthesis. Chemical grafting is the best way to enhance or modify the physical and chemical properties of MW-CNTs. I mainly investigated the electronic and structural modifications induced by chemisorption of atomic hydrogen/Deuterium on vertically aligned CNTs. I setup very efficient protocols to produce the atomic species in UHV enviornment and studied the MW-CNTs by using core-level (CL) X ray photoelectron spectroscopy (XPS), RAMAN spectroscopy and Ultra-violet Photoelectron spectroscopy (UPS).
Furthur issue was to produce controlled lattice damage on MW-CNTs by ion bombardment with rare gases, and to carefully analyze the anisotropic behaviour depending on iminging direction. I was able to observe the selective damage as a function of direction, masses, flux and energy.
I worked on building a new UHV system dedicated to efficient atomic production of hydrogen and its isotopes, and tested this system by hydrogenating a free standing graphene sample.
During my Phd research work I collaborated in MW-CNTs synthesis on a silicon wafer by Chemical vapor deposition method (CVD) and on their characterization by SEM.

Master of Science in Physics

COMSATS University Islamabad, Pakistan [05/09/2017 – 05/09/2019]

Address: Park Rd, Islamabad, Islamabad Capital Territory, Pakistan, 45550 Islamabad (Pakistan) | **Website:** https://www.comsats.edu.pk/ | **Final grade:** 3.38/4.00 | **Thesis:** Correlation of Structural and Thermoelectric Response of Bi-Li(CoZn)O2 Composites.

Short Description:
In my Master thesis, I worked on Thermoelectric materials, in particular with Lithium cobaltite. I synthesize Lithium cobaltite doped with zinc ($LiCo_xZn_{1-x}O_2$) (x=0.0,0.1,0.2) by simplified sol-gel method. Composites of lithium cobaltite doped with zinc were further prepared with different percentage and quantity of bismuth and in weight proportion of 5%,10%,15%. For structural analysis we used X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FTIR) techniques. AC electrical properties which include Dielectric constant, Dielectric loss, AC conductivity and impedance (Z) were measured as a function of frequency. DC electrical properties as a function of temperature was measured by using two probe method, at high temperature. I-V (Current and voltage) characteristic of all samples were measured at room temperature. Thermal transport properties of all samples were done by using advantageous transient plane source (ATPS) technology. Thermal conductivity, thermal diffusivity and volumetric heat capacity were measured as a function of temperature. All this work was done to find a composite that is best for thermoelectric applications.

Bachelor of Science, BS (Hons) Physics

University of Wah [05/09/2012 – 15/08/2016]

City: Wah Cantt | **Country:** Pakistan | **Website:** mdc.uow.edu.pk | **Final grade:** 2.98/4.00

FSc (Pre-Medical)

Mashal Degree College for Women [01/09/2010 – 07/08/2012]

Address: Quaid Avenue, Wah, Rawalpindi, Punjab, Pakistan, 47040 Wah Cantt (Pakistan) | **Website:** mdc.uow.edu.pk

WORK EXPERIENCE

Tutoring

Physics Laboratory in Sapienza University Rome, Italy [01/11/2022 – 31/07/2024]

City: Rome | **Country:** Italy

Guiding small groups of Master students in the Laboratory activity carried out at LOTUS laboratory within the course of Physics Laboratory of condensed matter.

Physics lecturer

Fauji Foundation College for Girls New Lalazar Rawalpindi [14/09/2020 – 29/09/2021]

Address: New Lalazar, Rawalpindi, Punjab, Pakistan, 44000 Rawalpindi (Pakistan)

- Delivered lectures of Solid State Physics, Nuclear Physics, Material Sciences, Laser Physics and Surface Physics to undergraduate students.
- Directed practical work in the research laboratory of Physics.
- Coordinated students affairs.

PROJECTS

[04/11/2024 – Current]

Impact of Functionalization on the Structural and Electronic Properties of Carbon Nanotubes.

"Progetti per Avvio alla Ricerca - Tipo 2" for the year 2024.

Principal investigator (PI) of a Sapienza University projects for Starting Research 2024.

[20/11/2023 – Current]

Atomic Deuterium Bonding to Multi-Walled Carbon Nanotubes.

"Progetti per Avvio alla Ricerca - Tipo 1" for the year 2023.

Principal investigator (PI) of a Sapienza University projects for Starting Research 2023.

HONOURS AND AWARDS

[23/10/2024] Journal Electrochem (ISSN 2673-3293) MDPI

Young Researcher Award

Journal Electrochem (ISSN 2673-3293) MDPI at the 5th International Conference on Materials Science & Nanotechnology (Future Materials-2024)

PUBLICATIONS

Atomic Deuterium bonding to Multi-Walled Carbon Nano Tubes.

This paper is in pipeline and ready to be submitted in journal.

[2024]

Evaluation of vertical alignment in carbon nanotubes: a quantitative approach

Journal: Nuclear Inst. and Methods in Physics Research.

[2023]

Spectromicroscopy Study of Induced Defects in Ion-Bombarded Highly Aligned Carbon Nanotubes

Journal: Nanomaterials (Special Issue Carbon Nanotubes and Nanosheets for Sustainable Solutions)

[2022]

Enhancement of Conductivity in Phase Pure and Doped Ceria for Fuel Cell Applications

· DOI: 10.1007/s11664-022-09507-9

Journal of Electronic Materials

[2021]

Thermoelectric properties in multifaceted Bi/lithium cobaltate composites

· DOI: 10.1007/s10854-020-05223-4

Journal of Materials Science: Materials in Electronics

CONFERENCES AND SEMINARS

[21/10/2024 - 25/10/2024] Athens, Greece

Deuterium Interaction with Carbon Nanotube Surfaces: Atomic-Scale Insights and Hydrogen Storage Implications.

5th International Conference on Materials Science & Nanotechnology (Future Materials-2024)

[27/05/2024 - 31/05/2024] France [Exhibition & Convention Center in Strasbourg (France)]

Selective Ion Bombardment of Multi-Wall Carbon Nanotubes.

Oral presentation in E-MRS 2024 SPRING MEETING.

[13/05/2024 - 15/05/2024] Pollica Physics Center, Salerno Italy

Deuterium adsorption on vertically aligned Carbon Nanotubes.

Oral presentation in PTOLEMY Collaboration Meeting.

[04/09/2023 - 08/09/2023] Milan, Italy

Atomic Deuterium Bonding to Vertically aligned Multi-walled Carbon Nanotubes.

Poster Presentation in joint CMD30-FisMat 2023 Conference .

[04/09/2023 - 08/09/2023] Milan, Italy

Alkali metal adsorption on highly aligned carbon nanotubes.

Poster Presentation in joint CMD30-FisMat 2023 Conference.

[02/03/2023 - 05/03/2023] Naples, Italy

Deuterium adsorption on Carbon Nanotubes and selective ion bombardment

Oral presentation in PTOLEMY Collaboration Meeting.

[22/10/2020 - 28/10/2020] Milas-Bodrum Turkey.

ICSM 2021

Oral presentation on three abstracts leading to papers; accepted in (International Conference on Superconductivity and Magnetism) ICSM 2021 held in Milas-Bodrum Turkey.

Islamabad, Paksitan

Structural and Electrical Response of Composite Li-Cobaltite Nanoparticles.
Poster Presentation in 16th International Symposium on Advanced Materials.

TECHNICAL SKILLS

List of skills

The majority of the skills are learned at university.

Operating X-ray photoelectron spectroscopy(XPS).

Operating Ultra high vacuum (UHV) system and pumping systems.

Synthesis of MW-CNTs by Chemical vapor deposition method (CVD)

Operating UHV equipment: (i) Ion gun, (ii) Mass spectrometry, (iii) Annealing by electron bombardment, (iv) Gaslines etc

Using: (i)UPS, (ii)SEM, (iii)XRD, (iv)Seebeck, (v)RAMAN, (vi) Advantageous transient plane source (ATPS) technology.

Data Analysis: (i) Igor software, (ii)Origin Software,

Softwares: (i) LaTeX, (ii)X-pert Highscore.

Programming Languages: (i) C++, (ii) Matlab, (iii)Root cause analysis.

LANGUAGE SKILLS

Mother tongue(s): Urdu

Other language(s):

English

LISTENING C2 **READING** C2 **WRITING** C2

SPOKEN PRODUCTION C2 **SPOKEN INTERACTION** C2

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user

RECOMMENDATIONS

Name: Prof. Carlo Mariani | PhD Supervisor
PhD Supervisor
Email: carlo.mariani@uniroma1.it | **Phone number:** (+39) 0649914393

Name: Prof. Muhammad Anis-ur-Rehman | MS Supervisor
MS Supervisor
Email: marehman@comsats.edu.pk | **Phone number:** (+92) 3215163059