

Curriculum Vitae

Dr. Arbab Mohammad Toufiq

Chairman, Deptt. of Physics

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Educational and Research Background

Visiting Researcher (March 2016-June 2016)

UNAM-National Nanotechnology Research Center, Institute of Materials Science and Nanotechnology, Bilkent University, Ankara, Turkey

Postdoctoral Associate (Jan 2015- Jan 2016)

*European Research Council (ERC) and Science and Technological Research Council of Turkey (TUBITAK) Funded Projects “**Novel Fibers for Acoustics and Fiber Laser Applications**” and “**Fabrication Scheme in Nanotechnology**”*

UNAM-National Nanotechnology Research Center, Bilkent University, Ankara, Turkey

PhD Gold Medalist (Experimental Condensed Matter Physics) 2011-2014

*School of Mathematics and Physics, Department of Physics, **University of Science and Technology Beijing, P. R. China** (2011-2014)*

Chairman, Department of Physics, Hazara University Mansehra, Pakistan (Dec 2022-present)

Associate Professor (BPS-20), Department of Physics, Hazara University Mansehra, Pakistan (Aug 2022-present)

Assistant Professor (BPS-19), Department of Physics, Hazara University Mansehra, Pakistan (Nov 01, 2018-July 2022)

Lecturer (BPS-18), Department of Physics, Hazara University Mansehra, Pakistan (May 2007-Oct 2018)

Lecturer (BPS-17), *Department of Electrical Engineering, Gandhara Institute of Science and Technology, GIST, Peshawar, Pakistan (May 2006-May 2007)*

Aims and Objectives of PhD Research

Fabrication of Group IV based advanced functional oxides novel nanostructures by a facile hydrothermal method.

Study their components and structural investigations by employing Scanning electron microscope, Transmission electron microscope, High-resolution transmission electron microscope, X-ray photoelectron spectroscopy, X-ray diffraction and Raman Spectroscopy.

Investigate the optical properties of the obtained advanced functional nanomaterials by probing their photoluminescence emissions and Ultraviolet-visible absorption behavior, Optical band gap values and their mechanism.

Study the magnetic properties employing vibrating sample magnetometer (VSM) and discuss their mechanism.

Analysis of the possible future applications of the synthesized nanostructures in solar cells, Ultraviolet and visible light emission devices and magnetic resonance imaging.

Research Accomplishments

The following main achievements have been obtained during my PhD research work by the efficient utilization of hydrothermal-growth strategy of MnO_2 , Mn_3O_4 and $\text{Cu}_{0.45}\text{Mn}_{0.55}\text{O}_2$ nanostructures with controlled morphology, dimension and orientation to achieve the desired physical properties for many potential applications.

Several novelties for various nanostructured 1D single-crystalline MnO_2 architectures such as improvement in the crystalline structure and surface morphology by introducing SiO_2 as a dopant, diameter-controlled synthesis by varying the hydrothermal reaction time, novel size-dependent magnetic properties with weak ferromagnetic characteristics, novel photoluminescence emissions in green-violet spectral region, maximum UV-visible absorption in the visible region and a wide band gap value of 2.5 eV has been studied in detail.

I have successfully reported the hydrothermal-growth of novel 3D Mn_3O_4 coins-like nanostructures self-assembled with randomly distributed single-crystalline nanoparticles. The novel photoluminescent spectra of the as-prepared Mn_3O_4 nanostructures exhibit prominent emission bands located in ultraviolet, violet, blue and green spectral regions without altering the surface chemistry of the material. In addition, a novel yellow PL emission peak has been observed and attributed to the d-d transitions involving Mn^{3+} ions in self-assembled randomly oriented nanoparticles. The observed highly photoluminescent response in the yellow –ultraviolet has been achieved without any surface modification.

Controlled synthesis of various 3D $\text{Cu}_{0.45}\text{Mn}_{0.55}\text{O}_2$ novel nanostructures including nano-whiskers self-assembled by interconnecting single-crystalline nanosheets, flowerlike nanostructures and nanoflowers self-assembled by interconnecting densely stacked single-crystalline nanoplates by a facile hydrothermal-growth strategy. The structural features are studied to analyze the near-neighbor environment of oxygen coordination around manganese and copper cations and reported for the first-time using Raman scattering spectroscopy. Furthermore, the thermodynamic phase stability, novel PL emission spectra in the red-violet spectral region, maximum UV-visible absorption in the visible region, wide band gap value of 2.53 eV and novel weak ferromagnetic properties have been reported during my PhD studies.

Objectives and Accomplishments of Postdoctoral Research

I have made significant contributions to the project by developing a **cutting-edge novel fabrication scheme in combination with MCVD method** for “Rare-earth doped Alumino-Silicate Nanoparticles” which is the first of its kind and considered as a major breakthrough in the field. The proposed fabrication scheme is sufficiently versatile and can be adapted to incorporate RE elements and co-dopants with excellent dopant uniformity and good repeatability.

My Postdoctoral Research is based on ERC and TUBITAK funded project “Novel Fibers for Acoustics and Fiber Laser Applications” in a well-known National Center and top world ranked University. The main responsibilities during my Postdoctoral research included Fabrication of “Rare-earth doped Alumino-Silicate Nanoparticles” for Preform growth using state-of-the-art Modified Chemical Vapor Deposition (MCVD) technique to produce High Power Fiber Lasers and their detailed analysis using advanced characterization tools such as WDS, TEM, SEM, EDX XPS, and Raman etc. Our focal research in the project has been to grow high quality preforms to gain high output power and high efficiency with low power losses in the drawn fiber. The primary focus of my Postdoctoral research is to develop a novel and an effective fabrication method for Rare-earth doped Silica nanostructures which can be combined with MCVD to obtain the best results to be reported for benefits of science community.

Total Number of International Peer reviewed Publications = 38

Science Citation Indexed (SCI) / W Category Publications = 34 (Web of Science / JCR)

Engineering Indexed (EI) Publications = 04 (EI Village)

Total Impact Factor = 80 (Thomson Reuters, Web of Science / JCR)

Number of Citations = 500+ (Thomson Reuters, Web of Science)

MS Research Students supervised as a PI = 20

MS Research Students supervised as Co-PI = 02

Ongoing Supervision of MS research students as PI = 02

(List of Publications)

- 1- **Arbab M. Toufiq**, Fengping Wang, Qurat-ul-Ain Javed and Yan Li “*Influence of SiO₂ on the Structure-Controlled Synthesis and Magnetic Properties of Prismatic MnO₂ Nanorods*” **Nanotechnology** Volume 24 (41), 2013, 415703.
- 2- **Arbab M. Toufiq**, Fengping Wang, Qurat-ul-Ain Javed, Quanshui Li and Yan Li “*Hydrothermal Synthesis of MnO₂ Nanowires: Structural Characterizations, Optical and Magnetic Properties*” **Appl. Phys. A** Volume 116, 2014, 1127-1132.
- 3- **Arbab M. Toufiq**, Fengping Wang, Qurat-ul-Ain Javed, Quanshui Li and Yan Li “*Hydrothermal Synthesis of Cu_{0.45}Mn_{0.55}O₂ Nanowhiskers: Structural Characterizations and Optical Properties*” **Mater. Lett.** Volume 118, 2014, 34-38.
- 4- **Arbab M. Toufiq**, Fengping Wang and Qurat-ul-Ain Javed “*Synthesis, Characterization and Optical Property of Shrimps-like Nanostructures of MnO₂ by Hydrothermal Route*” **J. Nanosci. Nanotech** Volume 13, 2013, 2948-2952.
- 5- **Arbab M. Toufiq**, Fengping Wang, Qurat-ul-Ain Javed, Quanshui Li and Yan Li “*Hydrothermal Synthesis of 3D Cu_{0.45}Mn_{0.55}O₂ Nanostructures: Lattice Vibrations and Novel Photoluminescence Properties*” **Appl. Phys. A**, Volume 115, 2014, 1133-1137.
- 6- **Arbab M. Toufiq**, Fengping Wang, Qurat-ul-Ain Javed, Quanshui Li, Yan Li and Matiullah Khan “*Synthesis, Characterization and Photoluminescent Properties of 3D Nanostructures self-assembled with Mn₃O₄ Nanoparticles*” **Mater. Exp.** 4, 2014, 258-262.
- 7- **Arbab M. Toufiq**, Fengping Wang, Qurat-ul-Ain Javed, Quanshui Li and Yan Li “*Synthesis and Characterization of 3D Cu_{0.45}Mn_{0.55}O₂ Nanoflowers with Novel Photoluminescence and Magnetic Properties*” **Mod. Phy. Lett. B** Volume 28 (9), 2014, 1450071.
- 8- **Arbab M. Toufiq**, Fengping Wang, Qurat-ul-Ain Javed and Yan Li “*Magnetic Properties of MnO₂ Shrimps-like Nanostructures Synthesized by Hydrothermal Route*” **Mod. Phy. Lett. B** Volume 27 (29), 2013, 1350215.
- 9- **Arbab M. Toufiq**, Fengping Wang, Qurat-ul-Ain Javed and Yan Li “*Effect of hydrothermal dwell time on the diameter controlled-synthesis and magnetic properties of MnO₂ Nanorods*” **Mod. Phy. Lett. B** Volume 28 (6), 2014, 1450045.
- 10- **Arbab M. Toufiq**, Fengping Wang, Qurat-ul-Ain Javed, Quanshui Li and Yan Li “*Photoluminescence Spectra and Magnetic Properties of Hydrothermally synthesized MnO₂ Nanorods*” **Mod. Phy. Lett. B** Volume 27 (29), 2013, 1350211.
- 11- Qurat-ul-Ain Javed, Fengping Wang, M Yasir Rafique, **Arbab M. Toufiq**, Quanshui Li, Hassan Mahmood and Waheed Khan “*Diameter-controlled Synthesis of α -Mn₂O₃ Nanorods and Nanowires with enhanced Surface Morphology and Optical Properties*” **Nanotechnology** 23, 2012, 415603.
- 12- Qurat-ul-Ain Javed, Fengping Wang, **Arbab M. Toufiq**, M Yasir Rafique, Hassan Mahmood “*Conspicuous reversible phase transformation of novel Cu_{1.4}Mn_{1.6}O₄ square nanosheets synthesized by auto-thermal process exhibiting intriguing optical and magnetic properties*” **Mater. Lett.** 99, 2013, 134-137.

- 13- Qurat-ul-Ain Javed, Fengping Wang, M Yasir Rafique, **Arbab M. Toufiq** and M. Zubair Iqbal "*Canted antiferromagnetic and optical properties of nanostructures of Mn_2O_3 prepared by hydrothermal synthesis*" **Chinese Phy. B** 21 (11), 2012, 117311.
- 14- Qurat-ul-Ain Javed, Fengping Wang, **Arbab M. Toufiq**, M Yasir Rafique, M. Zubair, Kamran M. Arshad "*Preparation, Characterizations and optical property of single crystalline $ZnMn_2O_4$ Nanoflowers via template free hydrothermal synthesis*" **J. Nanosci. Nanotech.** 13 (4), 2013, 2937-2942.
- 15- Qurat-ul-Ain Javed, Fengping Wang, **Arbab M. Toufiq** "*Controlled synthesis, characterizations and structural properties of micro-flowers, pine-cone, core-shell and liver-like micro-architecture of crystalline $ZnMn_2O_4$* " **J. Nanosci. Nanotech.** 13 (4), 2013, 2892-2896.
- 16- Qurat-ul-Ain Javed, Fengping Wang, **Arbab M. Toufiq**, Mahmood Hasan, M Yasir Rafique, Waheed Khan, Quanshui Li "*Effect of atomic percentage of Zn on the size and optical properties of porous $ZnMn_2O_4$ Nanoparticles*" **J. Nanosci. Nanotech.** 13 (4), 2013, 2917-2921.
- 17- Matiullah Khan, Wenbin Cao, Ning Chen, Zahid Usman, Dil Faraz Khan, **Arbab M. Toufiq**, Murad Ali Khaskheli "*Influence of Tungsten doping concentration on the electronic and optical properties of anatase TiO_2* " **Curr. Appl. Phys.** 13 (7), 2013, 1376-1382.
- 18- Ziya Wang, Fengping Wang, Yongkui Cui, Xingyang Li, **Arbab M. Toufiq**, Yanzhen Lu, Quanshui Li "*Novel Method to Enhance the Visible emission of ZnO Nanostructures*" **Chem. Phy. Lett.** Volume 614, 2014, 53-56.
- 19- M. Zubair Iqbal, Fengping Wang, M. Yasir Rafique, Rafi ud Din, Faheem K. Butt, Shujaat Ali, M. Ammar Khan, Qurat-ul-Ain Javed, **Arbab M. Toufiq** "*Fabrication, Characterization and Hydrogen Sorption Properties of Stannous Oxide Nano-Flowers*" **Sci. Adv. Mater.** Volume 5, 2013, 758-763.
- 20- Yongkui Cui, Fengping Wang, M Zubair Iqbal, Yan Li, **Arbab M. Toufiq**, Ziya Wang, Zhiyuan Wang, Shujaat Ali '*Synthesis of nanoflakes-based self-assembling crossed structure of stannous oxide and photocatalysis property*' **Cryst. Res. Tech.** Volume 50, 2015, 210-214.
- 21- Qurat-ul-Ain Javed, Hussain Abbas, Hasan Mahmood, A. Sattar, Fengping Wang, M. Arshad Kamran, M. Yasir Rafique, **Arbab M. Toufiq** '*Morphology-Controlled Synthesis of Single Crystalline α - Mn_2O_3 Sea-Urchins Assembled with Pen-Type Nanoneedles and Broad Absorption Spectrum*' **J. Nano Research** Volume 33, 2015, 38-48.
- 22- Hidayat Ullah Shah, Fengping Wang, **Arbab M. Toufiq**, Abdul Muqsit Khattak, Azhar Iqbal, Zahid Ali Ghazi, Shujaat Ali, Xingyang Li, Ziya Wang '*Electrochemical Properties of Single-Crystalline Mn_3O_4 Nanostructures and their Capacitive Performance in Basic Electrolyte*' **Int. J. Electrochem. Sci.** Volume 11, 2016, 8155-8162.
- 23- Hidayat Ullah Shah, Fengping Wang, **Arbab M. Toufiq**, Shujaat Ali, Zia Ul Haq Khan, Yan Li, Jianling Hu and Kang He '*Electrochemical Properties of Controlled Size Mn_3O_4 Nanoparticles for supercapacitor Applications*' **J. Nanosci. Nanotech** Volume 18, 2018, 719-724.
- 24- **Arbab M. Toufiq**, Fengping Wang, Hidayat Ullah Shah, '*Synthesis and Characterization of MnO_2 Nanowires: Lattice vibrations and Photoluminescence properties*' **Phys. Status Solidi c**, Volume 14, 2017, 1700176.

- 25- Shujaat Ali, Fengping Wang, M. Zubair Iqbal, Saba Zafar, Hidayat Ullah Shah, **Arbab M. Toufiq**, 'Hydrothermal Synthesis of Chalcogenide SnS Nanorods: Lattice Vibrations and Optical Properties' **Chalcogenide Lett.**, Volume 14 (12), 2017, 539-543.
- 26- Najmul Hassan, Junaid Riaz, M Tauseef Qureshi, Aamir Razaq, M Raheem, **Arbab M. Toufiq**, Abdul Shakoor, 'Vanadium Oxide (V_2O_3) for Energy Storage Applications through Hydrothermal Route' **J Mat. Sci.: Mater. in Elect.** Volume 29 (18), 2018, 16021-16026.
- 27- Amjad Khan, **Arbab M. Toufiq**, Fawad Tariq, Yaqoob Khan, Rafaqat Hussain, Naureen Akhtar, Shams ur Rahman 'Influence of Fe doping on the Structural, Optical and Thermal Properties of α -MnO₂ Nanowires' **Mater. Res. Exp.**, Volume 6 (6), 2019, 065043.
- 28- Mahnoor Ali, Rafaqat Hussain, Fawad Tariq, Zobia Noreen, **Arbab M. Toufiq**, Habib Bokhari, Naureen Akhtar, Shams ur Rahman 'Highly effective visible light-activated cobalt-doped TiO₂ nanoparticles for antibacterial coatings against *Campylobacter jejuni*' **Appl. Nanosci.**, Volume 10, 2020, 1005-1012.
- 29- Zafar Ali, Javaid Ismail, Rafaqat Hussain, A. Shah, Arshad Mahmood, **Arbab M. Toufiq**, Shams ur Rahman 'Hydrothermal synthesis and characterization of Carbon-doped TiO₂ nanoparticles' **Chin. Phy. B**, Volume 29, 2020, 118102.
- 30- Amjad Khan, Rafaqat Hussain, **Arbab M. Toufiq**, A. Shah, Basit Ali Khan, Zeeshan Niaz, Shams ur Rahman 'Fabrication of Cryptomelane $Fe_xMn_{1-x}O_2$ with enhanced antibacterial activity and specific heat capacity' **Mater. Charact.**, Volume 169, 2020, 110661.
- 31- Q U A Javed, Fengping Wang, Hasan Mahmood, M Yasir Rafique, **Arbab M. Toufiq**, M Zubair Iqbal, Pengbo Yang, 'Fabrication of Novel Sea-Urchin Cluster Assembled with Pen Type Nanoneedles of Hetaerolite ZnMn₂O₄ by Template-Free Hydrothermal Route' **Adv. Sci. Eng. and Med.**, Volume 4 (5), 2012, 388-393.
- 32- Q U A Javed, Fengping Wang, **Arbab M. Toufiq**, M Yasir Rafiq, M Zubair Iqbal, Hasan Mahmood, 'Spinel Oxide ZnMn₂O₄ Nanorods: Synthesis, Characterization and Optical Properties' **Adv. Sci. Eng. and Med.**, Volume 5 (2), 2013, 166-172.
- 33- **Arbab M. Toufiq**, A Güngör, A Akyüz, O İnan, 'Fabrication of 3D Cu_{0.45}Mn_{0.55}O₂ nanoflowers with novel photoluminescence and magnetic properties' **AIP Conf. Proc.**, Turkish Physical Society 34th International Physics Congress (TPS34) Volume 2042 (1), 2018, 020007.
- 34- A Akyuz, O Inan, A Gungor, **Arbab M. Toufiq** 'The Simulation of Shockwave lithotripsy' **AIP Conf. Proc.**, Turkish Physical Society 34th International Physics Congress (TPS34) Volume 2042 (1), 2018, 020054.
- 35- **Arbab M. Toufiq**, Rafaqat Hussain, A. Shah, Arshad Mahmood, Asmat Rehman, Amjad Khan, Shams ur Rehman, 'The Influence of Mn doping on the Structural and Optical Properties of ZnO Nanostructures' **Physica B: Condensed Matter**, Volume 604, 2021, 412731.

36- Nadim Ullah, Muhammad Tauseef Qureshi, **Arbab M. Toufiq**, Farman Ullah, Mahmoud Al Elaimi, Reda S Abdel Hameed, Amjad Khan, Hanan Mahmoud E Ragab, '*Effect of Cobalt doping on the structural, optical and antibacterial Properties of α -MnO₂ Nanorods*' Appl. Phys. A., Volume 127 (10), 2021, 1-7.

37- Arif Ullah, **Arbab M. Toufiq**, Muhammad Tauseef Qureshi, Amjad Khan, Mehwish Younas, Sofian Talal Obediat, Mahmoud Al Elaimi, Reda Abdel Hameed, Farman Ullah, '*Hydrothermal Synthesis of Ag-modified ZnO nanoplates; Physical properties and antimicrobial study*' Digest Journal of Nanomaterials and Biostructures, Volume 17 (3), 2022, 949-960.

38- M. Sajjad, M. Zia Ullah Shah, Fazal Mahmood, M. Sufyan Javed, Rabia Maryam, Furqan Ahmad, A. Shah, Rafaqat Hussain, **Arbab M. Toufiq**, Zhiyu Mao, Shams ur Rahman, '*CdO nanocubes decorated on rGO sheets as novel high conductivity positive electrode material for hybrid supercapacitor*' **Journal of Alloys and Compounds**, Volume 937, 2023, 168462.

Awards and Achievements

Vice President USTB International Student's Alumni Association Pakistan designated by International Office University of Science and Technology Beijing, P. R. China.

Lindau Alumni Peer Reviewer for 69th Lindau Nobel Laureate Meeting, Germany 30 June-5 July, 2019

Young Scientist Award in 65th Interdisciplinary Lindau Nobel Laureates Meeting in Lindau, Germany, 2015

Invited Speaker at the European Materials Research Society E-MRS Spring Meeting 2017, Strasbourg, France (May 22-26, 2017)

Invited Speaker at the 4th International Conference on Technology and Science (TECHNO-SCIENCE 2021), Antalya, Turkey (Nov 18-21, 2021)

Keynote Speaker / Invited Talk in International Conference on Nanocomposites and Multifunctional Materials 2017 held at National University of Sciences and Technology NUST, Islamabad, Pakistan (August 21-23, 2017)

President's Gold Medal 2014 for outstanding research contributions during Doctor's degree programme to the University of Science and Technology Beijing, P. R. China

The best PhD Thesis among the 2014 graduates in University of Science and Technology Beijing, P. R. China

Award of Outstanding Contributions to International Student Education for the 2012-2013 academic year during my PhD studies

Second Prize in USTB's Excellent International Student Scholarship for the 2012-2013 academic year during my PhD studies

Vice President of International Students Union i.e., NSSU (New generation students study abroad union) appointed by the International Office University of Science and Technology Beijing, P. R. China (2012-2014)

Masters training in Physics organized by HEC (Higher education Commission) of Pakistan held at Quaid-i-Azam University, Islamabad Pakistan from 16th July to 15th August 2007.

Member Senate, Hazara University Mansehra, Pakistan (2009-2012)

Life membership of Pakistan institute of Physics

HEC PhD Approved Supervisor (2021-2024)

Letter of Appreciation from Vice Chancellor and Dean of Sciences Hazara University Mansehra in recognition of the outstanding performance and research professionalism.