

# Curriculum Vitae

Dr. Asma Hayat

Centre for Advanced Studies in Physics (CASP)

GC University Lahore, Pakistan



## Present position

Assistant Professor (BS-19) in Physics  
CASP (Centre for Advanced Studies in Physics)  
Government College University Lahore, Pakistan  
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## Research interests

Laser Physics: Nano and femtosecond laser Physics (CO<sub>2</sub>, Nd: YAG, Excimer, Ti: Sapphire)  
Laser Ablation: Laser ablation on nanosecond and femtosecond time scale, nonlinear absorption  
Plasma Physics: Laser-induced breakdown spectroscopy, Cold plasma  
Surface Physics: Material modifications, AFM/SEM studies of laser ablated surfaces,  
Thin film deposition by Pulsed Laser Deposition (PLD) Technique

## Personal information

Born January 02, 1983 in Hafizabad, Pakistan, Pakistan Citizenship, married, 2 children

## Academic degrees

### **Throughout First Class Career**

- 2018 PhD. in Applied Physics from GCU (Government College University), Lahore  
**Project: Laser Induced Breakdown Spectroscopy Correlated with Probe Beam Deflection Technique for the Diagnosis of Metallic Plasma.**
- 2011 M-Phil. in Applied Physics from UET (University of Engineering and Technology), Lahore  
**Project: Emission Spectrum of UV and IR laser Induced Plasmas.**
- 2008 MSc. in Applied Physics from UET (University of Engineering and Technology), Lahore  
**Project: Laser Ablation of Materials.**

## Scientific publications (International)

1. Sadia Waheed, Shazia Bashir, Asma Hayat, Khaliq Mahmood, Muhammad Ammar Afzal, Aqsa Rauf, "Effect of external electric field on Laser-Induced Breakdown spectroscopy of vanadium plasma under different pressures of environmental gases" **IEEE Transactions on Plasma Science**, 53, (8), 1952-1966, August 2025. DOI: 10.1109/TPS.2025.3586816, Accepted 2nd July 2025, **ISSN: 1939-9375**, <https://ieeexplore.ieee.org/document/11085060/authors#authors>
2. Sadia Waheed, Shazia Bashir, Gin Jose, Robert Mathieson, Eric Kumi Barimah, **Asma Hayat**, Muhammad Rana Ayub, Sadia Waheed, "Femtosecond laser-induced breakdown spectroscopy of aluminum plasma under the vacuum & air environments at various laser irradiances" **Optik - International Journal for Light and Electron Optics**, 324 (2025) 172214, Accepted 4 January 2025, **ISSN 0030-4026** <https://doi.org/10.1016/j.ijleo.2025.172214>
3. Asadullah Dawood, Shazia Bashir, Muhmmad Asad Khan, **Asma Hayat**, Ebenezer Bonyah, Joseph H. Sanderson, Mehwish Majeed, Zarish Naz, "Optimizing Cu-alloy surface characteristics through magnetic field-enhanced fs laser treatment" **AIP advances**, 14, 055032 (2024). Accepted 7 May, **ISSN: 2158-3226**, <https://doi.org/10.1364/AO.523804>,
4. Rana Muhammad Ayub, Shazia Bashir Asadullah Dawood, Ebenezer Bonyah, Abdul Hamid Ganie, Khaliq Mahmood, Nisar Ahmad Koka, **Asma Hayat**, Mahreen Akram, Syed Zuhaib Haider Rizvi "Spatial confinement offered by a blocker on the laser induced breakdown spectroscopy of Ti plasma" **AIP advances**, 14, 055212 (2024). Accepted 13 July, **ISSN: 2158-3226**, <https://doi.org/10.1063/5.0201954>
5. Asadullah Dawood, Muhammad Asad Khan, Shazia Bashir, **Asma Hayat**, Ambreen Ayub, Joseph H. Sanderson "Examining the Role of Magnetic Fields in Plasma Behavior and Surface Evolution of Mg-Alloy with Varied Irradiances in Femtosecond Laser Treatment" **Applied Optics**, 63, 3585 (2024) Accepted: 26 March <https://doi.org/10.1063/5.0209894>
6. Muhammad Arif Mehmood, Shazia Bashir, **Asma Hayat**, Muhammad Shahid Rafique, Muhammad Hamza, Sajid Ali, Syed Muhammad Kamran Shabbir, Ammar Afzal "Modification in Surface Properties of Bismuth after Thermal Plasma Treatment" **Journal of Materials Engineering and Performance**, 1059-9495, Accepted: 6 Jan 2024, DOI: 0.1007/s11665-024-09214-y, 2024.
7. Muhammad Hamza, Shazia Bashir, **Asma Hayat**, Muhammad Shahid Rafique, Rana Muhammad Ayub, Saira Riaz, Shahzad Naseem, Muhammad Akram Raza, Muhammad Arif Mehmood, Sajid Ali, Syed Muhammad Kamran Shabbir, Muhammad Ammar Afzal "Surface Structuring of Zirconium by Thermal Plasma Treatment" **IEEE Transactions on Plasma Science**, 51(8), 2268-2281 (2023), ISSN: 1939-9375,

8. Shazia Bashir, Asadullah Dawood, **Asma Hayat**, Sameh Askar, Zubair Ahmad, Hijaz Ahmad, Muhammad Asad Khan “*Laser assisted ablation and plasma formation of Cu under controlled environmental conditions*” **Heliyon**, **9** (8), e18781 (2023), <https://doi.org/10.1016/j.heliyon.2023.e18781>, ISSN 2405-8440, Published, 1st August 2023, DOI: <https://doi.org/10.1016/j.heliyon.2023.e18781>
9. Maryum Riaz, Shazia Bashir, **Asma Hayat**, Zarish Naz “*Laser assisted ablation and plasma formation of Titanium explored by LIBS, QCM, optical microscopy and SEM analyses along with mechanical modifications under different pressures of Ar and Ne*” **Plasma Science and Technology**, **25**, 035508, (2023), Published 19 January 2023, DOI 10.1088/2058-6272/ac995b, ISSN: 2336-2634, 1.8 impact factor
10. Muhammad Shahzad Abdul Rahim, Khurram Siraj, S. U. Haq, Qamar Abbas, Shazia Bashir, Asma Hayat, Muhammad Shahid Rafique “*Enhancement and Optimization of Spectroscopic Characterizations of River Soil Plasma Under Magnetic Confinement*” **Arabian Journal for Science and Engineering**, **48**, 8089–8101 (2023) <https://doi.org/10.1007/s13369-022-07465-2>, Published: 28 November 2022.
11. Asadullah Dawood, Naveed Ahmed, Shazia Bashir, **Asma Hayat**, Syed Muhammad Abuzar Sarfraz, Ambreen Ayub “*Laser ablation of copper alloy under varying environmental conditions to achieve purpose-build surface structures*” **Coatings**, **12**(12), 1972 (2022), <https://doi.org/10.3390/coatings12121972>, ISSN: 2079-6412, 3.236
12. Saiyeda Nazli Fatma Kakarzai, Shazia Bashir, **Asma Hayat**, Rana Ayub, Mubashir Javaid “*Parametric study of magnetically confined Cu-plasma by using optical emission spectroscopy (OES) and Faraday cup (FC) techniques*, **Optik**, **271**, 170210 (2022).
13. Asadullah Dawood , Shazia Bashir, Naveed Ahmed, **Asma Hayat**, Abdullah Yahia AlFaify, Syed Muhammad Abouzar Sarfraz, Shahab Ahmed Abbasi, Ateekh Ur Rehman “*Surface Structuring and Thin Film Coating through Additive Concept Using Laser Induced Plasma of Mg Alloy: A Comparison between the Presence and Absence of Transverse Magnetic Field (TMF)*” **Coatings**, **12**, 1316, (2022).
14. Rana Muhammad Ayub, Shazia Bashir, Khaliq Mahmood, **Asma Hayat**, Asma Ashraf, Mahreen, Akram, Mubashir Javed, Nazli Fatima, *Langmuir probe characterization of spatially confined laser-induced Bismuth plasma*, **Optik**, **266**, 169566 (2022).
15. Haroon Ahmad, Shazia Bashir, **Asma Hayat**, Khaliq Mehmood, Ghulam Ghous, “*The irradiance-based growth of surface structures induced by nanosecond laser pulses on Si and Ge and their correlation with plasma ion kinetic energies and densities*” **Micro- and Nano-Manufacturing**, **10**, 011002 (2022). [ISSN 21660468, 21660476].
16. Shazia Bashir, Mahreen Akram, **Asma Hayat**, Waris Ghani, Shariqa Butt, Khaliq Mahmood, M. Rafique, Uzma Khaliq, Faizan Haq, *Langmuir probe characterization of spatially confined laser-*

17. *ablated Iron plasma along with surface modifications*, **IEEE Transactions on Plasma Science**, **50**, 1206-1217 (2022).
18. Muhammad Usman Aslam Bhatti, Shazia Bashir, **Asma Hayat**, Khaliq Mehmood, Rana Ayub, Mubashir Javaid “*Energy and flux measurements of laser induced silver plasma ions by using Faraday Cup*” **Plasma Science and Technology**, **23**, 085510 (2021).
19. Amna Batool, Shazia Bashir, **Asma Hayat**, Mahreen Akram, Khaliq Mahmood, Mubashar Javaid, Fida Hussain, Shariqa Hassan Butt, Haroon Ahmad, Zulaikha Irfan, Asadullah Dawood “*Time of flight measurements of energy and density of laser induced Mg plasma ions and investigation of ablated surface morphology*” **Physics of Plasmas**, **28**, 013113-(1- 11) (2020); doi: 10.1063/1.5139051.
20. Haroon Ahmad, Shazia Bashir, **Asma Hayat**, Khaliq Mahmood, Amna Batool, Fida Hussain, “*Investigation of Energy and Density of Laser-Ablated Si and Ge Plasma Ions Along with Surface Modifications*” **IEEE Transactions on Plasma Science**, **48**, 4191-4203 (2020). [ISSN 0093- 3813] DOI:10.1109/TPS.2020.
21. Zulaikha Irfan, Shazia Bashir, Shariqa Hassan Butt, **Asma Hayat**, Rana Ayub, Khaliq Mahmood, Mahreen Akram, Amina Batool “*Evaluation of electron temperature and electron density of laser-ablated Zr plasma by Langmuir probe characterization and its correlation with surface modifications*” **Laser & Particle Beams**, **38**, 84-93 (2020).
22. Khaliq Mahmood, Shazia Bashir, Faizan-ul-Haq, Mahreen Akram, **Asma Hayat**, Muhammad Shahid Rafique, Arshad Mahmood “*Surface, structural, electrical and mechanical modifications of pulsed laser deposited ZrN thin films by implantation of MeV carbon ions*” **Nuclear Instrument and Methods in Physics Research B**, **448**, 61–69 (2019).
23. **Asma Hayat**, Shazia Bashir, Donna Strickland, Shahid Rafique, Benji Wals, Sahr-al-Tariqui, Joe Sanderson “*The role of laser fluence and ambient environments on femtosecond laser induced breakdown spectroscopy and on surface morphology of Mg and Zr*” **Journal of Applied Physics**, **125**, 083302 (2019).
24. Khushboo Zehra, Shazia Bashir, Syed Ali Hassan, Qazi Salman Ahmed, **Asma Hayat**, Mahreen Akram “*Spectroscopic and morphological investigation of laser ablated silicon at various laser fluences*” **Optik-International Journal for Light and Electron Optics**, **164**, 186-200 (2018).
25. Asadullah Dawood, Shazia Bashir, Naveed Ahmed Chishti, Muhammad Asad Khan, **Asma Hayat**

- “*Magnetic field effect on plasma parameters and surface modification of laser-irradiated Cu-alloy*” **Laser and Particle Beams**, **36**, 261–275 (2018).
26. Mian Ahsan, Shazia Bashir, Mahreen Akram, Khaliq Mahmood, Faizan-ul-Haq, **Asma Hayat**, Naveed Ahmed Chishti, M. Asad Khan, Shahbaz Ahmad “*3 MeV proton irradiation effects on surface*,

- structural, field emission and electrical properties of brass” **Nuclear Instruments and Methods in Physics Research B**, **423**, 7-15 (2018).
27. Mahreen Akram, Shazia Bashir, Sohail Abdul Jalil, Muhammad Shahid Rafique, **Asma Hayat**, Khaliq Mahmood “*Investigation of field emission properties of laser irradiated tungsten*” **Applied Physics A**, **124**, 180-188 (2018).
  28. Mahreen Akram, Shazia Bashir, Sohail Abdul Jalil, Muhammad Shahid Rafique, **Asma Hayat**, Khaliq Mahmood “*Laser induced surface structuring of Cu for enhancement of field emission properties*” **Materials Research Express**, **5**, 25029-25040 (2018).
  29. **Asma Hayat**, Shazia Bashir, Muhammad Shahid Rafique, Riaz Ahmed, Mahreen Akram, Khaliq Mahmood, Ali Zaheer “*Spatial confinement effects on spectroscopic and morphological studies of nanosecond laser-ablated Zirconium*” **Optics and Laser Technology**, **97**, 60-70 (2017).
  30. **Asma Hayat**, Shazia Bashir, Muhammad Shahid Rafique, Riaz Ahmed, Mahreen Akram, Khaliq Mahmood, Ali Zaheer, Tousif Hussain, Asadullah Dawood “*Spatial confinement effects employed by metallic blocker and Ar gas pressures on laser induced breakdown spectroscopy & surface modifications of laser irradiated Mg*” **Laser and Particle Beams**, **35**, 313-325 (2017).
  31. **Asma Hayat**, Shazia Bashir, Muhammad Shahid Rafique, Riaz Ahmed, Mahreen Akram, Khaliq Mahmood, Ali Zaheer “*The role of spatial confinement for improvement of laser-induced Mg plasma parameters and growth of surface features*” **Applied Physics A**, **123**, 505-512 (2017).
  32. Saba Amin, Shazia Bashir, Safia Anjum, Mahreen Akram, **Asma Hayat**, Sadia Waheed, Hina Iftikhar, Asadullah Dawood, Khaliq Mahmood “*Optical emission spectroscopy of magnetically confined laser induced vanadium pentoxide ( $V_2O_5$ ) plasma*” **Physics of Plasmas**, **24**, 083112-183118 (2017).
  33. Sadia Waheed, Shazia Bashir, Asadullah Dawood, Safia Anjum, Mahreen Akram, **Asma Hayat**, Saba Amin, Ali Zaheer “*Effect of magnetic field on laser induced breakdown spectroscopy of zirconium dioxide ( $ZrO_2$ ) plasma*” **Optik-International Journal for Light and Electron Optics**, **140**, 536 (2017).
  34. Khushbo Zahra, Shazia Bashir, Ali Assan Kazmi, Qazi Salman Ahmed, Mahreen Akram, **Asma Hayat**, “*The effect of nature and pressure of ambient environment on laser-induced breakdown spectroscopy and ablation mechanisms of Si*” **Laser and particle beam**, **35**, 492-504 (2017).
  35. Hina Iftahkir, Shazia Bashir, Mahreen Akram, **Asma Hayat**, Khaliq Mahmood, Ali Zaheer “*Magnetic field effect on laser-induced breakdown spectroscopy and surface modifications of germanium at various fluences*” **Laser and particle Beams**, **35**, 159 (2017).

36. Mahreen Akram, Shazia Bashir, Muhammad Shahid Rafique, **Asma Hayat**, Khaliq Mahmood "*Laser Induced Surface Morphology of Molybdenum Correlated with Breakdown Spectroscopy*" **Plasma Chemistry and Plasma Processing**, **37**, 287-304, (2017).
37. Nazish Yaseen, Shazia Bashir, Muhammad Kaif Shabbir, Suhail Abdul Jalil, Mahreen Akram, **Asma Hayat**, Khaliq Mahmood, Faizan-ul-Haq, Riaz Ahmad, Tausif Hussain "*Nanosecond pulsed laser ablation of Ge investigated by employing photoacoustic deflection technique and SEM analysis*" **Physica B: Physics of Condensed Matter**, **490**, 31-41 (2016).
38. Aysha Khalid, Shazia Bashir, Mahreen Akram, **Asma Hayat** "*Spectroscopic and morphological studies of laser ablated silver*" **Optik-International Journal for Light and Electron Optics**, **127**, 5128-5134 (2016).
39. **Asma Hayat**, Shazia Bashir, Muhammad Shahid Rafique, Mahreen Akram, Khaliq Mahmood, Saman Iqbal, Asadullah Dawood, Arooj "*Spectroscopic and Morphological Study of Laser ablated Titanium*" **Optics and Spectroscopy**, **121**, 3-11 (2016).
40. Atiqa Arshad, Shazia Bashir, **Asma Hayat**, Mahreen Akram, Aysha Khalid, Nazish Yaseen, Qazi Salman Ahmad "*Effect of magnetic field on laser- induced breakdown spectroscopy of graphite plasma*" **Applied Physics B**, **122**, 63-73 (2016).
41. Arooj Khalid, Shazia Bashir, Mahreen Akram, **Asma Hayat** "*Laser-induced breakdown spectroscopy analysis of human deciduous teeth samples*" **Laser Applications in Medical Science**, **30**, 2233-2238 (2015).
42. **Asma Hayat**, Shazia Bashir, Mahreen Akram, Khaliq Mahmood, Muhammad Hassan Iqbal, "*Surface and morphological features of laser-irradiated silicon under vacuum, nitrogen ethanol*" **Applied Surface Science**, **357**, 2415-2425 (2015).
43. Mahreen Akram, Shazia Bashir, Muhammad Shahid Rafique, **Asma Hayat**, Khaliq Mahmood, Asadullah Dawood, M. F. Bashir "*Morphological and spectroscopic characterization of laser-ablated tungsten at various laser irradiances*" **Applied Physics A**, **119**, 859-870 (2015).
44. Muhammad Hassan Iqbal, Shazia Bashir, Muhammad Shahid Rafique, Asadullah Dawood, Mahreen Akram, Khaliq Mahmood, **Asma Hayat**, Riaz Ahmad, Tausif Hussain, Arshad Mahmood "*Pulsed laser ablation of Germanium under vacuum and hydrogen environments at various fluences*" **Applied Surface Science**, **119**, 859-870 (2015).
45. Khaliq Mahmood, Shazia Bashir, Mahreen Akram, **Asma Hayat**, Faizan-ul-Haq, Shahzad Saadat "*Carbon ion irradiation effects on pulsed laser deposited titanium nitride thin films*" **Surface Review and Letters**, **22**, 1550020-1550030 (2015).

46. Asadullah Dawood, Shazia Bashir, Mahreen Akram, **Asma Hayat**, Sajjad Ahmed, Muhammad Hassan Iqbal, Ali Hassan Kazmi *"Effect of nature and pressure of ambient environments on the surface morphology, plasma parameters, hardness, and corrosion resistance of laser-irradiated Mg-alloy"* **Laser and Particle Beams**, **33**, 315-330 (2015).
47. Mahreen Akram, Shazia Bashir, **Asma Hayat**, Khaliq Mahmood, Riaz Ahmad, and M. Khaleeq-U-Rehman *"Effect of laser irradiance on the surface morphology and laser induced plasma parameters of zinc"* **Laser and Particle Beams**, **32**, 119-128 (2014).
48. Nazia Sarwar, M. Shahid Rafique, Muneeb Irshad, M. Rafique, **Asma Hayat**, Shahbaz Majeed *"Laser Propagation through Poly-Methyl-Methacrylate (PMMA) Thin Films Prepared by Pulsed Laser Deposition"* **International Journal of Engineering Research & Technology (IJERT)**, **2**, 2472-2481 (2013).
49. Mohsan Jelani, Shazia Bashir, Muhammad Khaleeq-ur-Rehman, Riaz Ahamad, Faizan-ul-Haq, Daniel Yousaf, Mahreen Akram, Naveed Afzal, Muhammad Umer Chaudhry, Kahliq Mahmood, **Asma Hayat**, Sajjad Ahmad *"Effect of laser fluence on surface, structural and mechanical properties of Zr after irradiation in the ambient environment of oxygen"* **The European Physical Journal D**, **67**, 159-167 (2013).
50. Khaliq Mahmood, Shazia Bashir, M. Khaleeq-ur-Rahman, Nazar Farid, Mahreen Akram, **Asma Hayat**, Faizan-ul-Haq *"Effects of substrate temperature on structural, optical and surface morphological properties of pulsed laser deposition ZnO thin film"* **Surface Review and Letters**, **20**, 1350032-39 (2013).
51. Sidra Khan, Shazia Bashir, **Asma Hayat**, M. Khaleeq-ur-Rahman and Faizan-ul-Haq *"Laser-induced breakdown spectroscopy of tantalum plasma"* **Physics of Plasmas**, **20**, 0731041-0731048 (2013).
52. Saman Iqbal, Muhammad Shahid Rafique, Safia Anjum, **Asma Hayat**, Nida Iqbal *"Impact of X-Ray irradiation on PMMA thin films"* **Applied Surface Science**, **259**, 853– 860 (2012).
53. **Asma Hayat**, Anwar Latif, Muhammad Shahid Rafique, M. Khaleeq-ur- Rahman, Khurshid Aslam Bhatti, Arslan Usman, Adeel Rehman *"Surface modifications of materials by repetitive laser Pulses"* **Radiation Effects and Defects in Solids**, **167**, 403–409 (2012).
54. Anwar Latif, M. Khaleeq-ur-Rahman, Khurshid Aslam Bhatti, Muhammad Shahid Rafique, **Asma Hayat** *"Microstructural Morphological Changes in Laser Irradiated Platinum"* **Journal of Modern Physics**, **2**, 875-884 (2011).



## Symposium Participation

- i. 2nd National Symposium on “Laser Matter Interaction” at NCP, Islamabad Lahore, 17-18th September 2018.
- ii. 47th International Nathiagali Summer College from 20th June to 2nd July, 2022 as an invited speaker of the Nanosecond Laser Irradiance-Based Growth of Surface Structures on Si and Ge Correlated With Plasma Ion Kinetic Energies and Densities.

## International Conference Participation (Invited Speaker)

- iii. Bristol-Waterloo Symposium, 1-June 2017 at University of Waterloo, Canada.
- iv. 3rd International conference on “Materials Science and Nanotechnology 2019 (MSNANO-19) at Department of Physics, Government College University, Faisalabad 2019.
- v. Invited Speaker in 1st scientific activity on “High Power Lasers systems and their applications, at Nathiagali Summer College, 14-20 July, 2019.
- vi. Poster presentation, International Conference on Photonics, Electronics and Atomic Collisions (ICPEAC), International Centre Deauville, France.

## National Conferences

- i. 4th International conference on emerging trends in Physics 13 -15 JANUARY, LCWU With Department of Physics, COMSATS, Lahore

## Workshop attended

One day training on “Intellectual property rights” focuses on patent writing/drafting and submission held on October 09, 2024.

## Honor and Award

- i. Best Poster Presentation award in Plasma in “International Scientific Spring” (ISS) -2012, at NCP (National Center of Physics) Islamabad, Pakistan on March 2012.
- ii. Work with **Nobel Laureate 2018, Prof. Dr. Donna Strickland** as a co-supervisor at University of Waterloo, Canada.

## Reviewer

- i. Journal of Nuclear Materials (JNM)
- ii. Optik
- iii. Results in Physics (RINP)
- iv. Ceramics International

## Memberships

Lifetime Membership of Pakistan Institute of Physics (PIP)  
Lifetime Membership of Pakistan Physical Society (PPS)



## Professional career

29-08-2018 to Present	Assistant Professor (BPS-19), CASP, GCU Lahore
27-04-2012 to 28-08-2018	Lecturer (BPS-18), CASP, GCU Lahore (Permanent Position)
14-10-2011 to 27-04-2012	Lecturer (BPS-18), CASP, GCU Lahore, Pakistan (Contract)
04-05-2011 to 13-10-2011	Research/Teaching Assistant, Physics Department, UET (University of Engineering and Technology) Lahore, Pakistan
01-03-2009 to 10-04-2010	Lecturer, P.R. Lady Griffin College, Lahore, Pakistan

## References

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