# Dr. Devinder Singh

**DST-Inspire Faculty**

**Department of Physics**
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## Education

**2011 – Ph.D. in Expt. Condensed Matter Physics from Institute of Science, Banaras Hindu University, India**

**2005 – M.Sc. in Physics from Banaras Hindu University, India**

**2003 – B.Sc. in Physics from Banaras Hindu University, India**

## Postdoctoral Research and Teaching

- **DST INSPIRE Faculty (2013 - present)** at Panjab University, Chandigarh, India

  **Project Title:** Investigations of Some New Metallic Systems in Regard to their Synthesis and Properties

- **Postdoctoral Fellow (Aug 2012 – Aug 2013 & Nov 2014 – Nov 2015)** at Stockholm University, Sweden

  **Project Title:** Electron crystallography of Quasicrystal and Quasicrystal Approximants

  **Mentor:** Prof. Sven Hovmöller and Prof. Xiaodong Zou

## Ph.D. Research

**Title of Ph.D. Thesis:** Investigations on the Synthesis, Characterization and Properties of Metallic Glasses, Nanocrystalline/Quasicrystalline-Glass Composites in some Zr/Cu-Based Alloys

**Supervisor:** Prof. R.S. Tiwari and Prof. O.N. Srivastava

## Current Research Interests

Metallic Glasses, Quasicrystals, Nanomaterials, Nanoquasicrystal-glass composites, Crystallization behavior, Rapid Solidification, Phase Transformations, Mechanical properties, Hydrogen storage, Magnetic properties, Heusler alloys, 3D-Rotation Electron Diffraction (RED), Structure solution, refinement and modeling of Quasicrystal Approximants.

## Ongoing Research Projects

**Project Title:** Investigations of Some New Metallic Systems in Regard to their Synthesis and Properties

**Funding Agency:** Department of Science and Technology (DST), New Delhi

**Research Grant and Duration:** 35 Lakhs for 5 years

## Current Ph.D. Student

- Sheenam Sachdeva (2014 onwards)

## Academic Honors/Awards/Fellowships

- **DST-INSPIRE Faculty Award** by DST & INSA, New Delhi (2013).
- **Postdoctoral Fellowship** by Stockholm University, Sweden (2012 & 2014).
- **Senior Research Fellow Extn/Research Associate Award** by CSIR, New Delhi (2012).
- **Senior Research Fellow Award** by CSIR, New Delhi (2010-2012).
- **Project Fellow** in DST, New Delhi sponsored project (2006-2010).
- **DST International Travel Award** to attend International Conference and Workshop on Quasicrystals (ICQ11), Japan (2010).
- **B.H.U. prize and K.P. Devasthali Award** for first rank in B.Sc. (2003).
- **Best Poster Award** in Structure and thermodynamics of emerging materials (STEM-2009) at Convention centre, Anupuram, Kalpakkam, India (2009).
- **Best Poster Award** in One day conference on New Trends in Research at Department of Physics, B.H.U., Varanasi (2007).

## Memberships

- Life Member of Indian Science Congress Association (ISCA).
- Member of the Advisory board of Journal of Nanotechnology & Nanoscience (Bioinfo Publications).
- Member of Editorial board of Journal of Materials Science (Enriched Publications)

## Training/Courses

- **Introduction to Analytical Electron Microscopy**; Duration: 4 weeks at Stockholm University, Sweden (2012)*
- **Advanced Transmission Electron Microscopy**; Duration: 4 weeks at Stockholm University, Sweden (2012)*
- **Workshop on Nano & Advanced Materials**; Duration: 1 week at Department of Physics, B.H.U., Varanasi (2012)
- **Winter School on Practical Crystallography and Structure Solution**; Duration: 1 week at Department of Physics, B.H.U., Varanasi (2014)
- **Workshop on Heterogenous Catalysis & Kinetics**; Duration: 1 week at IIT (B.H.U.), Varanasi (2006)

*The above two trainings/courses helps me to learnt and worked with electron diffraction both SAED (selected area electron diffraction) and RED (Rotation electron diffraction), the new 3D electron diffraction technique. I have also learnt and practiced HRTEM (High resolution transmission electron microscopy) and learnt to use the computer programs SIR and SHELX for solving and refining crystal structures from 3D diffraction data. During my training, I have worked on the modern, advanced electron microscopes (JEOL 2100 LaB6 and FEG) and taken "driver's licence" to operate these instruments entirely on my own.

## Publications

- Research Papers Published in International Journals (SCI): **28**
- Book: **1**
- Book Chapters: **3**
- Citations of Research Papers: **170**
- H-index: **9** i-10 index: **9**
- Presentations in International / National Conferences: **26**
  - Publications in International Conferences: 13
  - Publications in National Conferences: 13

## List of Publications

**1.** Dharmendra Singh, **Devinder Singh**, R.K. Mandal, O.N. Srivastava, R.S. Tiwari "Crystallization behaviour and mechanical properties of $(Al_{90}Fe_5Ce_5)_{100-x}Ti_x$ amorphous alloys", Journal of Alloys and Compounds 687 (2016) 990.

**2.** Dharmendra Singh, **Devinder Singh**, R.K. Mandal, O.N. Srivastava, R.S. Tiwari "Effect of annealing on the devitrification behaviour and mechanical properties of rapidly quenched Ce-based glassy alloys", Journal of Non-Crystalline Solids 445 (2016) 53.

**3.** Dharmendra Singh, **Devinder Singh**, O.N. Srivastava, R.S. Tiwari "Microstructural effect on the low temperature transport properties of Ce-Al (Ga) metallic glasses", Scripta Materialia 118 (2016) 24.

**4. Devinder Singh**, Y. Yun, W. Wan, B. Grushko, X. Zou, S. Hovmoller, "Structure determination of a pseudo-decagonal quasicrystal approximant by the strong reflections approach and rotation electron diffraction", Journal of Applied Crystallography 49 (2016) 433.

**5. Devinder Singh**, R.K. Mandal, R.S. Tiwari, O.N. Srivastava, "Effect of cooling rate on the crystallization and mechanical behaviour of Zr-Ga-Cu-Ni metallic glass composition", Journal of Alloys and Compounds 648 (2015) 456.

**6.** R.K. Mandal, R.S. Tiwari, **Devinder Singh**, Dharmendra Singh, "Influence of Ga substitution on the nature of glasses in $Zr_{69.5}Al_{7.5-x}Ga_xCu_{12}Ni_{11}$ and $Ce_{75}Al_{25-x}Ga_x$ metallic glass compositions", MRS proceedings 1757 (2015), doi:10.1557/opl.2015.45.

**7.** S Hovmöller, **Devinder Singh**, W. Wan, Y. Yun, W. Wan, B. Grushko, X. Zou, "Quasicrystal approximants solved by Rotation Electron Diffraction (RED)", Acta Crystallographica A 70 (2014) 1195.

**8. Devinder Singh**, Y. Yun, W. Wan, B. Grushko, X. Zou, S. Hovmoller, "A complex pseudo-decagonal quasicrystal approximant, $Al_{37}(Co, Ni)_{15.5}$, solved by rotation electron diffraction", Journal of Applied Crystallography 47 (2014) 215.

**9.** TP Yadav, SS Mishra, SK Pandey, **Devinder Singh**, M Lowe, R Tamura, NK Mukhopadhyay, ON Srivastava, R McGrath, HR Sharma, "Leaching of Al-based polygrain quasicrystalline and related crystalline surfaces", Acta Physica Polonica A 126 (2014) 629.

**10.** Dharmendra Singh, **Devinder Singh**, R.K. Mandal, O.N. Srivastava, R.S. Tiwari, "Glass forming ability, thermal stability and indentation characteristics of $Ce_{75}Al_{25-x}Ga_x$ metallic glasses", Journal of Alloys and Compounds 590 (2014) 15.

**11. Devinder Singh**, Dharmendra Singh, T.P. Yadav, R.K. Mandal, R.S. Tiwari and O.N. Srivastava, "Synthesis and microhardness behaviour of amorphous and nanocrystalline phases in rapidly quenched Cu-Ga-Mg-Ti and Cu-Al-Mg-Ti alloys", Metallography, Microstructure and Analysis 2 (2013) 321.

**12. Devinder Singh**, Rohit R Shahi, T.P. Yadav, R.K. Mandal, R.S. Tiwari and O.N. Srivastava, "Hydrogenation of $(Zr_{69.5}Al_{7.5}Cu_{12}Ni_{11})_{100-x}Ti_x$ quasicrystalline alloys and its effect on their structural and microhardness behavior", Journal of Non-Crystalline solids 380 (2013) 11.

**13. Devinder Singh**, R.S.Tiwari and O.N.Srivastava, "Structural and magnetic properties of $Cu_{50}Mn_{25}Al_{25-x}Ga_x$ Heusler alloys", Journal of Magnetism and Magnetic Materials 328 (2013) 72.

**14.** T.P. Yadav, **Devinder Singh**, M.A.Shaz, R.S.Tiwari and O.N.Srivastava, "Synthesis of quasicrystalline film of Al-Ga- Pd-Mn alloy", Thin Solid Films 534 (2013) 265.

**15.** T.P. Yadav, **Devinder Singh**, R.S.Tiwari and O.N.Srivastava, "Enhanced microhardness of mechanically activated carbon-quasicrystal composite", Materials Letters 80 (2012) 5.

**16. Devinder Singh**, T.P. Yadav, R.K. Mandal, R.S.Tiwari and O.N.Srivastava, "Nanoindentation characteristics of $Zr_{69.5}Al_{7.5-x}Ga_xCu_{12}Ni_{11}$ glasses and nanocomposites", Journal of Alloys and Compounds 509 (2011) 8658.

**17. Devinder Singh**, T.P. Yadav, R.K.Mandal, R.S.Tiwari and O.N.Srivastava, "Effect of Ti addition on the quasicrystalline phase formation and indentation characteristics of $Zr_{69.5}Al_{7.5}Cu_{12}Ni_{11}$ alloy", Philosophical Magazine 91 (2011) 2837.

**18.** T.P. Yadav, **Devinder Singh**, R.R. Shahi, M.A.Shaz, R.S.Tiwari and O.N.Srivastava, "Formation of quasicrystalline phase in $Al_{70-x}Ga_xPd_{17}Mn_{13}$ alloys", Philosophical Magazine 91 (2011) 2474.

**19.** T.P. Yadav, **Devinder Singh**, N.K. Mukhopadhyay, R.S.Tiwari and O.N.Srivastava, "Low temperature synthesis and optical properties of $(Cu,Cr,Fe)Al_2O_4$ Nanocrystalline Spinel materials", International Journal of Nanoscience, 4 & 5 (2011) 861.

**20.** K. Awasthi, R. Kumar, H. Raghubanshi, S. Awasthi, **Devinder Singh**, T.P. Yadav and O.N.Srivastava, "Synthesis of nano-carbon (nanotubes, nanofibers, graphene) materials", Bulletin of Materials Science 34 (2011) 607.

**21. Devinder Singh**, Manjeet Singh, T.P. Yadav, R.K. Mandal, R.S. Tiwari and O.N. Srivastava, "Nanoindentation studies of metallic glasses and nanoquasicrystal-glass composites in Zr-Al (Ga)-Cu-Ni Alloys", International Journal of Nanoscience 10 (2011) 929.

**22. Devinder Singh**, T.P. Yadav, R.K.Mandal, R.S.Tiwari and O.N.Srivastava, "Indentation characteristics of metallic glass and nanoquasicrystal–glass composite in Zr–Al (Ga)–Cu–Ni alloys", Intermetallics 18 (2010) 2445.

**23. Devinder Singh**, T.P. Yadav, R.K.Mandal, R.S.Tiwari and O.N.Srivastava, "Effect of Ga substitution on the crystallization behaviour and glass forming ability of Zr-Al-Cu-Ni alloys", Materials Science and Engineering: A 527 (2010) 469.

**24. Devinder Singh**, T.P. Yadav, R.S.Tiwari and O.N.Srivastava, "Phase formation in rapidly quenched Cu-based alloys", Journal of Materials Science 44 (2009) 3883.

### Book Chapters:

**25. Devinder Singh,** R.K. Mandal, R.S. Tiwari, O.N. Srivastava, "Mechanical Behaviour of Zr-based Metallic Glasses and their Nanocomposites", Metallic Glass, InTechOpen access books, ISBN: 978-953-51-4785-5 (2016), In Press.

**26. Devinder Singh,** R.K. Mandal, R.S. Tiwari, O.N. Srivastava, "Role of Nano-Quasicrystals in the Formation of Shear Bands in Zr-based Glassy Alloys", Nanotechnology: Novel Perspectives and Prospects, McGraw-Hill, ISBN: 978-93-392-2109-6 (2015) 461

**27. Devinder Singh**, R.S. Tiwari, O.N. Srivastava, R.K. Mandal, "Synthesis and Mechanical Properties of $Zr_{69.5}Ga_{7.5}Cu_{12}Ni_{11}$ Metallic Glass and Nanoquasicrystal-glass Composites", Emerging Paradigms in Nanotechnology, Pearson Education, ISBN: 978-81-317-8991-9 (2013) 81.

### Book:

**28. Devinder Singh,** R.S. Tiwari, O.N. Srivastava, "Metallic Glasses, Quasicrystals and their Nanocomposites", Lap Lambert Academic Publishing, Germany**,** ISBN: 978-3-659-62088-1, 111156 (2014) 165.

## International Conference/Workshop Presentations

**1.** Workshop on "**Nano-materials and Devices for Energy Applications**" at "International Conference on Nano Science and Technology 2010" at IIT Bombay, Mumbai, India, February 17, 2010 **(Participated)**

**2.** "**International Conference on Nano Science and Technology**" **(ICONSAT 2010)** at IIT Bombay, Mumbai, India, February 17-20, 2010 **(Presented a paper)**

**3.** "**International Workshop on Strengthening of Magnesium Alloys by Application of Quasicrystal and Related Phases"** at National Institute of Materials Science, Tsukuba, Japan, June 10-11, 2010 **(Participated)**

**4. "11th International Conference on Quasicrystals" (ICQ 11)** at Hokkaido University, Sapporo, Japan, June 13-18, 2010 **(Presented a paper)**

**5.** "**International Conference on Multifunctional Materials (ICMM-2010)"** at Department of Physics, Banaras Hindu University, Varanasi-221005, India, December 7-9, 2010 **(Presented a paper)**

**6. "2nd International Conference on Advanced Nanomaterials and Nanotechnology (ICANN-2011)"** at Department of Physics and Centre for Nanotechnology, IIT Guwahati, India, December 8-10, 2011 **(Presented a paper)**

**7. "International Pre-Conference Workshop on Frontiers in Nanoscience, Nanotechnology and their Applications" (NanoSciTech-2012)** at Panjab University, Chandigarh, India, February 15, 2012 **(Participated)**

**8. "International Conference on Frontiers in Nanoscience, Nanotechnology and their Applications" (NanoSciTech-2012)** at Panjab University, Chandigarh, India, February 16-18, 2012 **(Presented a paper)**

**9. "International Conference on Hydrogen Production (ICH2P) - 2012"** at Seoul, Korea, June 24-27, 2012 **(Presented a paper)**

**10. "International Pre-Conference Workshop on Development and Characterization of Nanostructured Systems" (NanoSciTech-2014)** at Panjab University, Chandigarh, India, February 12, 2014 **(Participated)**

**11. "International Conference on Frontiers in Nanotechnology in the Service of Health, Environment and Society" (NanoSciTech-2014)** at Panjab University, Chandigarh, India, February 13-15, 2014 **(Presented a paper)**

**12. "International Conference on Nanoscience and Technology" (ICONSAT-2014)** at Panjab University, Chandigarh, India, March 2-5, 2014 **(Presented a paper)**

**13. "International Conference on Electron Microscopy & XXXV Annual Meeting of Electron Microscope Society of India (EMSI)"** at University of Delhi, Delhi-110007, India, July 9-11, 2014 **(Presented a paper)**

**14. "2nd 3DEM-NATUR workshop on 3D Electron Microscopy for Nanostructure Research"** at Stockholm University, Stockholm, Sweden, May 21, 2015 **(Presented a paper).**

## National Conference/Workshop Presentations

**1.** One-day workshop on "**Nanoscience and Technology**" (Organized by DST Nanoscience and Technology Centre/Unit, B.H.U., Varanasi, India), March 20, 2006 **(Participated)**

**2.** National "**Workshop on Heterogeneous Catalysis and Kinetics"** Dept of Chemical Engineering and Technology, Institute of Technology, BHU, Varanasi, India 12-21st June 2006 **(Participated)**

**3.** Symposium on "**Recent Developments in Nano-Materials**" (Organized by DST Nanoscience and Technology Centre/Unit, B.H.U., Varanasi, India), March 13-14, 2007 **(Presented a paper)**

**4.** 1st One day Conference on "**New Trends in Research**" Dept of Physics, B.H.U., Varanasi-221005, India, October 27, 2007 **(Presented a paper)**

**5.** 2nd One day Conference on "**New Trends in Research**"Dept of Physics, B.H.U., Varanasi-221005, India, January 17, 2009 **(Presented a paper)**

**6.** Structure & Thermodynamics of Emerging Materials (STEM-2009), "**Workshop on Thermodynamics and Kinetic Modelling of Phase and Microstructural Stability of Alloys**" at Convention Centre, Anupuram, Kalpakkam, Chennai, India, September 24-25, 2009 **(Presented a paper)**

**7.** Symposium on "**Recent Advances in Nano-Materials and their Applications"** (Organized by DST Nanoscience and Technology Centre/Unit, B.H.U., Varanasi, India), March 7-9, 2009 **(Presented a paper)**

**8.** 3rd One day Conference on "**New Trends in Research**"Dept of Physics, B.H.U., Varanasi-221005, India, March 20, 2010 **(Presented a paper)**

**9. "National Conference on Experimental Tools for Materials Science Research: State of Art"** at Department of Physics, Mahila Mahavidyalaya, Banaras Hindu University, Varanasi-221005, India, December 3-4, 2010 **(Presented a paper)**

**10.** "**Workshop on Multifunctional Materials"** at Department of Physics, Banaras Hindu University, Varanasi-221005, India, December 6, 2010 **(Participated)**

**11.** 4th One day Conference on "**New Trends in Research**" Dept of Physics, B.H.U., Varanasi-221005, India, March 03, 2011 **(Presented a paper)**

**12. "National Conference on Nanomaterials and Applications: Present Position and Road Ahead "** at Nanoscience and Technology Centre, Department of Physics, Banaras Hindu University, Varanasi-221005, India, March 16-18, 2011 **(Presented a paper)**

**13.** 5th One day Conference on "**New Trends in Research**" Dept of Physics, B.H.U., Varanasi-221005, India, February 25, 2012 **(Presented a paper)**

**14. "Workshop on Nano and Advanced Materials and their Applications" (WONAMA-2012)** at Dept of Physics, B.H.U., Varanasi-221005, India, April 10-16, 2012 **(Participated)**

**15. "Winter School on Practical crystallography and structure solution under UGC Networking Program"** at Department of Physics, B.H.U., Varanasi-221005, India, March 5-11, 2014 **(Participated)**

**16.** 8th One day Conference on "**Recent Trends in Research**" Dept of Physics, B.H.U., Varanasi-221005, India, February 07, 2015 **(Presented a paper)**