

Assistant Professor

Department of Physics

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Date of Birth: 23rd July 1983

Nationality: Indian

Status: Married



Personal Profile:

Strong experience in Nanomagnetism, Magnetic thin film preparation and characterization, Strong analytic and management skills

Technical Experience:

- Thin film and multilayer deposition (Sputtering, evaporation, spin-coating)
- Synthesis of ferrite magnets for permanent magnet applications
- Magnetometry with SQUID and PPMS-VSM systems (Quantum design and Lakeshore)
- Scanning electron microscopy and electron beam lithography (FEI system)
- X-ray diffraction, XMCD, XMLD measurements and analysis
- Atomic force microscopy, Magnetic force microscopy, Kerr Microscopy
- X-ray imaging and scattering of magnetic thin films and technique development at synchrotron facilities
- X-ray and neutron reflectivity and small angle scattering
- Instrumentation for UHV chambers and beamlines at synchrotron facilities

Research Experience:

- **September 2017 - June 2018**

Senior Postdoc at Institute for Materials for Electronics and Magnetism, Parma, Italy

- ❖ Anisometric permanent hybrid magnets based on inexpensive and non-critical materials

■ February 2017 - April 2017

Guest Scientist at Max-Born Institute Berlin, Germany

- ❖ Setting up Lab for self-assembly and spin-coating of nanomaterials and thin film characterization lab

■ January 2014 - December 2016

Research Scientist at Helmholtz-Zentrum Berlin, Germany (Postdoc)

Supervisor: Prof Dr Stefan Eisebitt

- ❖ Soft x-ray small angle scattering on out-of-plane magnetized multilayers (CoPd and CoPt systems) and nanostructures (nanoparticles and nanowires)
- ❖ XMCD and XMLD scans from NiO/Co exchange bias system
- ❖ Developing x-ray imaging techniques such as Holography and Ptychography

■ May 2013 - December 2013

Research Scientist at Ruhr University Bochum, Germany (Postdoc)

Supervisor: Prof Dr Hartmut Zabel

- ❖ Characterization of Ultra-thin films of Holmium and Dysprosium by x-ray resonant magnetic scattering with ALICE at Bessy, Germany
- ❖ Magnetic dipole interaction between iron oxide nanoparticles in self-assembled monolayers

■ November 2008 - June 2012

Research Assistant at Ruhr University Bochum (PhD)

Supervisors: Prof Dr Hartmut Zabel and Dr Oleg Petravic

PhD thesis: "Structural and magnetic characterization of self-assembled magnetic nanoparticles"

- ❖ Preparation of iron-oxide nanoparticle monolayer and multilayers on various substrates by spin-coating, solvent evaporation and dip-coating
- ❖ Structural characterization of crystallinity and different phases of iron oxide such as Fe_3O_4 , Fe_2O_3 and FeO by grazing incidence x-ray diffraction (GI-XRD) and electron diffraction
- ❖ SQUID magnetometry for hysteresis, zero field cooling and field cooling study
- ❖ Coupling in iron oxide nanoparticle and Co thin film composites
- ❖ Advanced structural characterization by x-ray reflectivity (XRR), grazing incidence small angle x-ray scattering (GISAXS)
- ❖ Transmission electron microscopy (TEM) including dark field TEM for shape, size and phase study and high resolution transmission electron microscopy for crystallinity study

- ❖ Polarized neutron reflectivity to identify Superferromagnetic state
- ❖ E-beam lithography for template-assisted self-assembly

■ September 2007 - May 2008

DAAD fellowship for Master project at Karlsruhe Institute of Technology

Supervisors: Prof Dr Bodh Raj Mehta and Prof Dr Horst Hahn

M.Tech. Thesis: "Synthesis and characterization of ferroelectric, La doped

$\text{Bi}_4\text{Ti}_3\text{O}_4$ by sol-gel route"

- ❖ Processed ferroelectric material La doped Bismuth titanate ($\text{Bi}_{3.25}\text{La}_{0.75}\text{Ti}_3\text{O}_{12}$) thin films by spin-coating and annealing
- ❖ Successful characterization by x-ray diffraction, electron microscopy and P-E loop measurements
- ❖ X-ray diffraction with *in-situ* annealing upto 700° C and analysis of structures

Teaching Experience:

■ Courses taught for B.Tech, M.Sc. and PhD

- ❖ Condensed Matter Physics
- ❖ Magnetism and Superconductivity
- ❖ Vacuum systems and Thin film technology
- ❖ Engineering Design

■ Laboratory course for B.Tech. and M.Sc.

- ❖ Electromagnetism and Optics
- ❖ Condensed Matter Physics

Awards, Fellowships and Honors:

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| 2013 | Research mentioned in Scientific Highlights of ILL annual report (2013, section: Magnetism, page 26 - 27) |
| 2012 | Paper published in Nanotechnology 23 , 055707 (2012) journal " <i>Self-assembled iron oxide nanoparticle multilayer: x-ray and polarized neutron reflectivity</i> " selected as cover paper of that issue |
| 2012 | Research mentioned in Scientific Highlights of ESRF (Page 74, 2012) |

- 2008 NRW Graduate School fellowship: Research with Synchrotron Radiation for Nano- and Bio-Sciences
- 2007 DAAD Scholarship to carry out M.Tech. Thesis work at Karlsruhe Institute of Technology (KIT) under Prof. Horst Hahn

Education:

- Nov 2008 – June 2012 **PhD in Experimental Condense Matter Physics** Ruhr University
Bochum, Germany
- Jul 2006 – Jul 2008 **M. Tech. in Solid State Material** Indian Institute of
Technology Delhi
- Jul 2004 – June 2006 **M.Sc. in Physics**, Utkal University, Bhubaneswar, India
- Jul 2001 – June 2004 **B.Sc. (Physics, Mathematics and Chemistry)**
Ravenshaw Autonomous College, Cuttack, India

IT Skills:

Scientific software: Matlab, Origin Lab, Solid works, IsGISAXS, OOMMF

Computer software: MS Office, LaTeX, Corel Draw

Language:

Fluent verbal and written **English**, B1 level in **German**, Hindi and Oriya (Native)

Hobbies:

Reading novels, science-fictions and science magazines, playing cricket and cooking

List of publications:

1. M.Stingaciu, **D. Mishra**, C. de Julián Fernández, R. Cabassi, M.Christensen, A. Eikeland and S. Deledda
"High magnetic coercive field in Ca-Al-Cr substituted strontium hexaferrites" (Under preparation)
2. S. Dash, A. Lukoyanov, Nancy, **D. Mishra**, U. P. Mohammed, R. Gangineni, M. Vasundhara, A. Patra
"Structural stability and magnetic properties of geometrically frustrated Mn₂FeAl alloy" (Under review)
3. S. Flewett, **D. Mishra**, T. J. A. Mori, C. M. Guenther, J. C. Denardin, S. Oyarzun, S. Michea, D. Engel, M. Fohler, T. C. R. Rocha, A. Ovalle F., L. T. Nunez A., B. Pfau, J. Escrig and S. Eisebitt

- "Three-dimensional characterization of Co/Pd multilayer thin films Using resonant soft x-ray scattering"*, Physical Review B **95**, 094430 (2017)
4. M. Fohler, S. Frommel, M. Schneider, B. Pfau, C. Gunther, M. Hennecke, E. Guhrs, L. Shemilt, **D. Mishra**, D. Berger, S. Selve, D. Mitin, M. Albrecht and S. Eisebitt
"A general approach to obtain soft x-ray transparency for thin films grown on bulk Substrates", Review of Scientific Instruments **88**, 103701 (2017)
 5. D. Engel, **D. Mishra** and S. Eisebitt
"CXs: Coherent X-ray scattering at the UE-49 SGM at Bessy II", Journal of large-scale research facilities **2**, A56 (2016)
 6. **D. Mishra**, O. Petravic, A. Devishvili, K. Theis-Bröhl, B. P. Toperverg and H. Zabel
"Polarized neutron reflectivity from monolayers of self-assembled magnetic nanoparticles", J. Phys.: Condens. Matter **27**, 136001 (2015)
 7. **D. Mishra**, H. Zabel, S. V. Ulyanov, V. P. Romanov and V. M. Uzdin
"Template assisted self-assembly of iron oxide nanoparticles: An x-ray structural analysis", J. Appl. Phys. **115**, 054104 (2014)
 8. **D. Mishra**, D. Greving, G. A. Badini Confalonieri, P. Szary, J. Perlich, B. P. Toperverg, H. Zabel and O. Petravic
"Growth modes of nanoparticle superlattice thin films", Nanotechnology **25**, 205602 (2014)
 9. **D. Mishra**, M. J. Benitez, O. Petravic, G. A. Badini Confalonieri, P. Szary, F. Brüßing, K. Theis-Bröhl, A. Devishvili, A. Vorobiev, O. Konovalov, M. Paulus, C. Sternemann, B. P. Toperverg and H. Zabel
"Self-assembled iron oxide nanoparticle multilayer: x-ray and polarized neutron reflectivity" Nanotechnology **23**, 055707 (2012)
(Selected as the cover page of that issue)
 10. M. J. Benitez*, **D. Mishra***, P. Szary, G. A. Badini Confalonieri, M. Feyen, A. H. Lu, L. Agudo, G. Eggeler, O. Petravic and H. Zabel
"Structural and magnetic characterization of self-assembled iron oxide nanoparticle arrays" J. Phys.: Condens. Matter **23**, 126003 (2011) (* equal contribution)
 11. K. Theis-Bröhl, **D. Mishra**, B. P. Toperverg, H. Zabel, B. Vogel, A. Regtmeier and A. Hütten
"Self organization of magnetic nanoparticles: A polarized grazing incidence small angle neutron scattering and grazing incidence small angle x-ray scattering study" J. Appl. Phys. **110**, 102207 (2011)
 12. G. A. Badini Confalonieri, V. Vega, A. Ebbing, **D. Mishra**, P. Szary, V. M. Prida, O. Petravic and H. Zabel

"Template-assisted self-assembly of individual and clusters of magnetic nanoparticles" Nanotechnology **22**, 285608 (2011)

13. R. Salikhov, R. Abrudan, F. Brüssing, St. Buschhorn, M. Ewerlin, **D. Mishra**, F. Radu, I. A. Garifullin and H. Zabel
"Precessional dynamics and damping in Co/Cu/Py spin valves" Appl Phys. Letts. **99**, 092509 (2011)
14. G. A. Badini Confalonieri, P. Szary, **D. Mishra**, M. J. Benitez, M. Feyen, A. H. Lu, L. Agudo, G. Eggeler, O. Petravic and H. Zabel
"Magnetic coupling mechanisms in particle/thin film composite systems" Beilstein J. Nanotech. **1**, 101 (2010)

Presentations (Talks):

1. **Invited Talk** at International Conference on Magnetic Materials and Applications (ICMAGMA-2018), 9 – 13 December 2018
2. Department Seminar at IIT Jodhpur, India, 23rd October 2018
3. Invited Seminar at Institute of chemistry of organometallic compounds, Florence, Italy, 19th December 2017
4. Institute seminar at Institute of Materials for Electronics and Magnetism, Parma, Italy, 5th October 2017
5. Advances in Polarized Neutron Reflectometry, Bochum, Germany, 3 – 4 July 2013
6. 12th International Conference on Surface X-ray and Neutron Scattering, Kolkata, India, 25 – 28 July 2012
7. Invited Talk, Department of Physics, Ravenshaw University, Cuttack, India, August 2012
8. DPG-Frühjahrstagung Dresden 2011, Germany, 14 – 18 March 2011
9. DPG-Frühjahrstagung Regensburg 2010, Germany, 21 – 26 March 2010

Presentations (Poster):

1. International colloquium on Magnetic Films and Surfaces, Cracow, Poland, 12 – 17 July 2015
2. Joint BER II and BESSY II User Meeting, Berlin, Germany, 9 – 11 December 2015
3. Joint BER II and BESSY II User Meeting, Berlin, Germany, 3 – 5 December 2014
4. GISAXS 2013, Hasylab, Hamburg, Germany, 9 – 11 October 2013
5. GISAXS 2011, Hasylab, Hamburg, Germany, 10 – 12 October 2011