

Publications List

• Published (27)

27. Mukul Gupta,
Crossover in Growth Exponent upon Nanocrystallization of Amorphous Thin Film,
[J. Applied Physics](#) 98, 064305 (2005).
26. Mukul Gupta, A. Gupta, R. Gupta and T. Gutberlet,
Self-Diffusion in Nanoscale Structures Measured by Neutron Reflectometry,
[J. Phase Equilibria and Diffusion](#), 26, 458-465 (2005).
25. R. Gupta and Mukul Gupta,
Nanocrystallization and Amorphization Induced by Reactive Nitrogen Sputtering in Iron and Permalloy,
[Phys. Rev B](#). 72, 024202 (2005); arXiv cond-mat/0412657.
24. A. Gupta, Mukul Gupta, S. Chakravarty, R. Rüffer, H.-C. Wille, O. Leupold,
Fe Diffusion in Amorphous and Nanocrystalline Alloys using Nuclear Resonance Reflectivity,
[Phys. Rev. B](#). 72, 014207 (2005).
23. Surendra Singh, Saibal Basu, A.K. Poswal and Mukul Gupta
Unpolarized and polarized neutron reflectometry for magnetic structure of nickelcopper multilayer film,
[Solid State Communications](#), 136, 400 (2005).
22. T. Brýs, M. Daum, P. Fierlinger, P. Geltenbort, D. George, Mukul Gupta, R. Henneck, S. Heule et al,
A Novel Apparatus for the Investigation of Material Properties for the Storage of Ultracold Neutrons,
[Nuclear Instruments and Methods in Physics Research Section A](#), 550, 637-646 (2005).
21. T. Brýs, M. Daum, P. Fierlinger, P. Geltenbort, Mukul Gupta, R. Henneck, S. Heule et al,
Measurement of the Loss and Depolarization Probability of UCN on Beryllium and Diamond Like Carbon Films,
[Journal of Research of the Natl. Inst. Stand. Technol.](#), 110, 279-281 (2005).
20. A. Gupta, P. Rajput, A. Saraiya, V. R. Reddy, Mukul Gupta, S. Bernstorff and H. Amenitsch,
Depth Profiling of Marker Layers Using X-Ray Waveguide Structures,
[Phys. Rev.B](#),72, 075436 (2005).
19. Mukul Gupta, A. Gupta, S. Chakravarty, T. Gutberlet, R. Rüffer, H.-C. Wille, O. Leupold,
Self-Diffusion Measurements in Iron-Based Chemically Homogeneous Multilayers using Nuclear Resonance and Neutron Reflectivity,
[Mater. Res. Soc. Symp. Proc.](#) 840, Q1.7.1 (2005).
18. J. Padiyath, J. Stahn, P. Allenspach, M. Horisberger, Mukul Gupta, T. Gutberlet and P. Böni,
Smooth Interfaces of Multilayer Monochromators,
[Physica B](#) 357, 218 (2005).
17. Mukul Gupta, A. Gupta, S. Chakravarty and T. Gutberlet,
Iron Self-Diffusion in Chemically Homogeneous Multilayers,
[Defect and Diffusion Forum](#), 237-240, 548 (2005).
16. C. Schanzer, V.R. Shah, T. Gutberlet, Mukul Gupta, P. Böni and H.B. Braun,
Magnetic Depth Profiling of FM/AF/FM Trilayers by PNR,
[Physica B](#) 356, 46 (2005).
15. Mukul Gupta, A. Gupta, L. M. Kukreja, P. Mishra, S. Rajagopalanl, A. K. Balamurgan and A. K. Tyagi,
Self-Diffusion of Iron in Nanocrystalline Iron Nitride Deposited by Pulsed Laser Ablation,
[Material Science Forum](#) 480-481, 557 (2005).
14. T. G. Reddy, P. Y. Reddy, V. R. Reddy, A. Gupta, Mukul Gupta, K. R. Reddy,
On the Coexistence of Spin and Lattice Polarons in the $La_{0.67-x}Eu_xCa_{0.33}MnO_3$ CMR System,
[Solid State Communications](#) 133, 77 (2005).

13. Mukul Gupta, A. Gupta, J. Stahn, M. Horisberger, T. Gutberlet and P. Allenspach, *Iron Self-Diffusion in Amorphous FeZr/⁵⁷FeZr Multilayers Measured by Neutron Reflectometry*, *Phys. Rev. B* 70, 184206 (2004).
12. Mukul Gupta and A. Gupta, *Structural and Magnetic Properties of Ion-Beam Sputtered FeZr thin films*, *Physica Status Solidi C1*, 3211 (2004).
11. R. Gupta, Mukul Gupta, A. Chainani, C. Jhariwala, A. Gupta and S. M. Chaudhari, *Structural and Magnetic Properties of Fe/Ni Multilayers*, *Physica Status Solidi C1*, 3651 (2004).
10. A. Gupta, Mukul Gupta, S. Rajagopalan, A. K. Balamurgan and A. K. Tyagi, U. Pietsch, S. Ayachit, *Iron Self-Diffusion in Nanocrystalline FeZr Films*, *J. Non-Crystalline Solids* 343, 39-47 (2004).
9. Mukul Gupta, T. Gutberlet, J. Stahn, P.Keller and D. Clemens, *AMOR-the time-of-flight Neutron Reflectometer at SINQ/PSI*, *Pramana - J. Phys.* 63, 57 (2004).
8. R. Gupta, A. Gupta, S.M.Chaudhari, Mukul Gupta, P. Allenspach, *Study of Interfacial Properties and it's Effect on Magnetization Behavior of Fe/Ni Multilayer structure*, *Applied Surface Science* 238, 254-261 (2004).
7. A. Gupta, A. Paul, Mukul Gupta, C. Meneghini, U. Pietsch, K. Mibu, A. Maddalena, S. Dal Toè, G. Principi, *Structural Characterization of Epitaxial Fe/Cr Multilayers using Anomalous X-ray and Neutron Reflectivity*, *J. Magn. Magn. Mat.* 272-276, 1219-1220(2004).
6. A. Gupta, Mukul Gupta, B. A. Dasannacharya, S. Kikuta, Y. Yoda, M. Seto, *Pure Nuclear Reflections from ^{nat}FeN_{0.7}/⁵⁷FeN_{0.7} Multilayer*, *J. Phys. Soc. Jpn.* 73, 423-429 (2004).
5. Mukul Gupta, A. Gupta, D.M. Phase, S.M. Chaudhari, and B. A. Dasannacharya, *Development of an Ion Beam Sputtering System for Depositing Thin Films and Multilayers of Alloys and Compounds*, *Applied Surface Science* 205, 309-322 (2003).
4. Mukul Gupta, A. Gupta, S.Rajagopalan and A. K. Tyagi, *Self-Diffusion of Iron in Amorphous Iron Nitride*, *Phys. Rev. B* 65, 214204 (2002).
3. D. Clemens, Mukul Gupta and T. Gutberlet, *AMOR-The Multi Optional time-of-flight Reflectometer at SINQ/PSI*, *Swiss Neutron News* 22, 25 (2002).
2. Mukul Gupta, A. Gupta, S.M. Chaudhari, D.M. Phase, V. Ganesan, B. A. Dasannacharya et al, *Microstructural Study of Iron Nitride Thin Film Deposited by Ion Beam Sputtering*, *Vacuum* 60, 399 (2001).
1. Mukul Gupta, A. Gupta, P. Bhattacharya, P. Misra and L. M. Kukreja, *Study of Iron Nitride Thin Films Deposited by Pulsed Laser Deposition*, *J. Alloys and Compounds* 326, 265-269 (2001).

• **Articles Communicated (2), In-Preparation (5)**

1. H. Schmidt, Mukul Gupta, T. Gutberlet, M. Bruns, *TSelf-diffusion in Amorphous Silicon Nitride Isotope Multilayers Probed by Neutron Reflectometry*, communicated to *Phys. Rev. Lett.*
2. R. Gupta, Mukul Gupta, S. K. Kulkarni, S. Kharrazi, A. Gupta, S. M. Chaudhari, *Thermal stability of nm-range Ti/Ni multilayers*, communicated to *Thin Solid Films*.
3. Mukul Gupta et al, *TEM Investigation of Grain Growth in amorphous FeN with In Situ Annealing*, In-preparation.
4. Mukul Gupta et al, *Fe and N Self-Diffusion in Nanocrystalline FeN*, In-preparation.

5. Mukul Gupta and R. Gupta, 'Oxidation' of Nascent FeN Thin Films, In-preparation.
6. Mukul Gupta et al, Composition Dependence of Iron Self-Diffusivity in FeZr/⁵⁷FeZr, In-preparation.
7. Mukul Gupta A. Gupta, S. Chakravarty, T. Gutberlet, Iron Self-Diffusion in Nanocomposite FeZr alloys measured by neutron reflectivity: Effect of applied compressive stress, In-preparation.

- **Conferences (Self-Presented Only)**

- **Invited Talks (In conferences + Institutes) (8)**

25. Self-Diffusion in Nanoscale Structures Measured by Neutron Reflectometry, Plenary Lecture at 1st International Conference on Diffusion in Solids and Liquids (DSL-2005) July 6-8 (2005), University of Aveiro (Portugal).
24. Iron Self-Diffusion in Amorphous and Nanocrystalline Alloys using Nuclear Resonance Reflectivity, Nuclear Resonant Scattering Workshop, March 24-26(2004), ESRF, Grenoble (France).
23. AMOR-the time-of-flight Neutron Reflectometer at SINQ/PSI, Conference on Neutron Scattering, January 2-4 (2004), BARC, Mumbai (India).
22. Amorphous and Nanocrystalline Thin Films , May 2005, University of Århus, Århus (Denmark).
21. Amorphous and Nanocrystalline Thin Films and Multilayers : X-ray and Neutron Reflectometry Investigations, May 2005, University of Durham, Durham (UK).
20. Self-Diffusion at Nanoscale, 19th March 2005, Banaras Hindu University, Varanasi (India).
19. Study of Self-Diffusion and Magnetic Properties in Metallic Multilayers with Neutron Reflectometry at AMOR, Indian Institute of Technology, January 9th(2004) Roorkee (India).
18. Preparation and Characterisation of Multilayers with ⁵⁶Fe/⁵⁷Fe superstructure for application as nuclear Bragg monochromator, Paul Scherrer Institute, January 26th(2002) Villigen, (Switzerland).

- **Oral Presentations (8)**

17. Self-Diffusion Measurements in Iron-Based Chemically Homogeneous Multilayers using Nuclear Resonance and Neutron Reflectivity, MRS Fall Meeting, Nov 27-Dec 03 (2004) Boston (U.S.A.).
16. Iron Self-Diffusion in Chemically Homogeneous Multilayers, DIMAT 2004, July 17-23 (2004) Krakow (Poland).
15. Structural and Magnetic Properties of Ion-Beam Sputtered FeZr Thin Films, 2nd Seeheim Conference on Magnetism, June 27-July 1 (2004) Seeheim, (Germany).
14. Iron Self-Diffusion in Amorphous and Nanocrystalline FeZr Films 1st Summer School on Condensed Matter Research, August 10-17(2002) Zuoz (Switzerland).
13. Iron Self-Diffusion in Nanocrystalline FeZr Films Deposited by Ion Beam Sputtering, National Symposium on Science and Technology of Vacuum and Thin Films, (IVSNS 2001), Sep. (2001), IISc, Bangalore (India).
12. Microstructural Studies on Thin Films and Multilayers by X-Ray Reflectivity, National Seminar cum Workshop on Surface modifications and characterizations by energetic ion beams, Nov. 24 (2001) University of Rajasthan, Jaipur (India).
11. Growth of Iron Nitride Thin Films Deposited by Discharge Assisted Pulse Laser Deposition, PLD 2001, November 26-28 (2001) CAT, Indore (India).
10. Observation of Pure Nuclear Diffraction from ^{natural}FeN_{0.7}/⁵⁷FeN_{0.7} Multilayer, DAE-SSPS, December 26-30 (2001) BARC, Mumbai (India).

- **Poster Presentations (9)**

9. Structural and Magnetic Properties of Fe/Ni Multilayers, 2nd Seeheim Conference on Magnetism, June 27-July 1(2004) Seeheim (Germany).
8. Self-Diffusion of Iron in Nanocrystalline Iron Nitride, 1st International Meeting on Applied Physics APHYS-2003, 15-18 October (2003) Badajoz (Spain).
7. Study of Interfacial Properties and it's Effect on Magnetization Behaviour of Fe/Ni Multilayer Structure, 1st APHYS-2003, 15-18 Oct. (2003) Badajoz (Spain).

6. *Self-Diffusion of Iron in Amorphous Iron Nitride*, DAE-SSPS, Dec. 26-30 (2001) BARC, Mumbai (India).
5. *New-Cubic-Type Phases in FeN Thin Films Grown by Discharge-Assisted Pulsed Laser Deposition*, Proc. DAE-SSPS 43, 182 Dec. 26-30 (2000) Bilaspur (India).
4. *Study of Iron Nitride Thin Films Deposited by Pulsed Laser Deposition*, (ICMM 2000), Oct. (2000) SINP, Calcutta (India).
3. *Study of Amorphous FeZr Thin Film Deposited by Ion-Beam Sputtering*, Proc. DAE-SSPS 43, 184, Dec. 26-30(2000) Bilaspur (India).
2. *Calculation of Density of Thin Film by Energy Dispersive X-ray Reflectivity*, DAE-SSPS 42,395, Dec. 26-30 (1999) Kalpakkam (India).
1. *Microstructural Study of Iron Nitride Thin Film Deposited by Ion Beam Sputtering*, DAE-BRNS Workshop on Thin Film Multilayers, October 6-8 (1999) BARC, Mumbai (India).

- **Annual Reports**

1. *Neutron Reflectivity Measurements on DLC Foils at AMOR*, T. Brýs, M. Daum, P. Fierlinger, Mukul Gupta, R. Henneck, M. Kasprzak, K. Kirch, K. Kohlik, M. Meier, A.Pichlmaier, PSI Scientific Report (2004).
2. *Fe and N Self-Diffusion in Nanocrystalline FeN*, Mukul Gupta, R. Gupta, M. Horisberger and T. Gutberlet, PSI Scientific Report (2004).
3. *Fe Self-Diffusion Under Applied Stress in Nanocomposite FeZr*, Mukul Gupta, A. Gupta, S. Chakravarty, M. Horisberger, P. Keller and T. Gutberlet, PSI Scientific Report (2004).
4. *Nanocrystallization and Amorphization Induced by Reactive Nitrogen Sputtering*, R. Gupta and Mukul Gupta PSI Scientific Report (2004).
5. *In Situ Vacuum Furnace at AMOR*, Mukul Gupta, T. Gutberlet, M. Zolliker, PSI Scientific Report (2004).
6. *Options for Polarized Time-of-flight Neutron Reflectometry at AMOR*, Mukul Gupta, J. Stahn and T. Gutberlet, PSI Scientific Report (2003).
7. *Self-Diffusion of Iron in Amorphous Fe₆₇Zr₃₃ Multilayers Measured with Neutron Reflectometry*, Mukul Gupta, A. Gupta, T. Gutberlet, J. Stahn, M. Horisberger and P. Allenspach, PSI Scientific Report (2003).
8. *Self-Diffusion of Iron in n – Fe₆₄N₂₆Zr₁₀ Measured with Nuclear Resonance Reflectivity*, A. Gupta, Mukul Gupta, S. Chakravarty, M. Horisberger, R. Rüffer, H.-C. Wille and O. Leupold, PSI Scientific Report (2003).
9. *Magnetic Field Distribution in High Tc SC/FM Multilayers*, J. Stahn, Ch. Niedermayer, T. Gutberlet, Mukul Gupta, H.-U. Habermeier, J. Chakhalian, C. Bernhard and J. Hoppler, PSI Scientific Report (2003).
10. *Effect of Interface Roughness on Interlayer Coupling in Fe/Cr Multilayers*, Mukul Gupta, A.Gupta, T. Gutberlet, P. Allenspach, H. K. Grimmer and M. Horisberger, PSI Scientific Report, pp 56 (2002).
11. *Structural and Magnetization Behaviour of Fe/Ni Multilayers*, R. Thakur, S. M. Chaudhari, A. Gupta, P. Allenspach and Mukul Gupta, PSI Scientific Report pp 57 (2002).

- Also co-author in more than 15 experimental reports resulting from the experiments performed in various research fields along with different users world wide. The reports can be viewed at <http://sinq.web.psi.ch/sinq/instr/amor/news.html>

Publication List with Journal Names

Journal Name	No. of Publications
Physical Review B	5
Applied Surface Science	2
Physica Status Solidi C	2
Physica B	2
Solid State Communications	2
Journal of Applied Physics	1
Journal of Physical Society of Japan	1
Journal of Non-Crystalline Solids	1
Journal of Magnetism and Magnetic Materials	1
Material Research Society Symposium Proceedings	1
Defect and Diffusion Forum	1
Material Science Forum	1
Pramana - Journal of Physics	1
Swiss Neutron News	1
Vacuum	1
Journal of Alloys and Compounds	1
Nuclear Instruments and Methods in Physics Research A	1
Journal of Phase Equilibria and Diffusion	1

Summary of Research Work

Brief Description of Work Done During Ph.D. Thesis

Thesis Title: Preparation and Characterization of Multilayers with $^{56}\text{Fe}/^{57}\text{Fe}$ Superstructure for Application as Nuclear Bragg Monochromator

Summary

The aim of my thesis was to prepare a chemically homogenous multilayer of type $^{56}\text{Fe}/^{57}\text{Fe}$ and to explore its feasibility as a Nuclear Bragg Monochromator (NBM) for Synchrotron Radiation (SR). Monochromators based on scattering from electrons (e.g. single crystals) have energy resolution at the best in sub meV range. In order to perform experiments related with Mössbauer spectroscopy at SR sources, an energy resolution in the range of μeV - neV is required. Isotopic labelling using Mössbauer active nuclei allows nuclear resonant reflectivity (NRR) from ^{57}Fe , while off-resonance entire media works like a homogeneous media. A Bragg peak reflected due to periodicity of ^{57}Fe has purely nuclear origin and the energy resolution is defined by the hyperfine splitting of the resonating nuclei which is in the range of μeV - neV . Problems arising in achieving a good peak reflectivity were dealt in the thesis and it was shown that an amorphous and nonmagnetic Fe alloy yields smoother and sharper interfaces [1, 2]. An amorphous NBM of $^{natural}\text{FeN}/^{57}\text{FeN}$ was successfully prepared and tested at SPring-8 SR source (Japan) [3].

In order to prepare an NBM structure a proper deposition system was required. After trying various possibilities [4], low energy ion beam sputtering (IBS) was chosen as the method for deposition for preparing an NBM superstructure. Therefore, I was involved in designed and development of an ion beam sputtering system at IUC-DAEF, Indore [5]. The system was optimized for depositing thin films and multilayers of alloys and compounds.

Brief Description of Work Done During Post Doc

Since May 2002, I am working as Post Doctoral Fellow at Paul Scherrer Institut (PSI), Villigen, Switzerland. Officially, the responsibility is divided into 3 parts:

- 50% of the time is devoted to provide local support in the experiments for guest scientists coming from all over the world. The experiments are mainly related to probe structural and magnetic properties of hard and soft-condensed matter thin films and multilayers using Neutron Reflectometry (NR) at AMOR instrument at PSI/SINQ, Switzerland.
- 20% of the time is devoted for the development of instrument
- 30% for own research.

A brief description of research work carried during post doc is given below.

Instrument Development

I was involved in instrument development at AMOR neutron reflectometer along with a team consisting of people from various discipline. The time-of-flight (TOF) and polarization-analysis options at AMOR were successfully realized during the initial period of my post doc [6, 7]. The set-up of TOF option required definition of incoming neutron beam by suitably selecting the chopper speed, phasing and distance between the choppers and the distance between chopper and detector. Polarization option required a proper selection of wavelengths reflected from the *Supermirror* and optimization of magnetic fields and guide field through out the line of neutron beam at AMOR.

In order to probe self-diffusion in chemically homogeneous multilayers, using neutron reflectometry, I was involved in design and development of a dual-zone heating vacuum furnace at PSI [8]. Such a furnace provides options to measure neutron reflectometry with *in-situ* heating up to 1000 K with a pressure in the range of 1×10^{-6} mbar.

Research Work

Along with doing instrument development and user operation, I continued my research work concerning structural and magnetic properties of amorphous and nanocrystalline thin films and atomic self-diffusion in chemically homogeneous multilayers (CHM). Self-diffusion measurements were carried out in CHM of [$^{natural}\text{FeZr}/^{57}\text{FeZr}$], [$^{natural}\text{FeN}/^{57}\text{FeN}$], and [$\text{FeN}/\text{Fe}^{15}\text{N}$]. It was found that the self-diffusion mechanism is not highly collective but involves a rather small group of atoms [9]. In order to further confirm the self-diffusion mechanism a compressive stress was applied to the samples during deposition. For this purpose, I designed and developed a 3-point Si wafer bending device with help of mechanics group at PSI. Application of applied compressive stress essentially resulted in an increased value of activation energy, due to partial annihilation of defects formed during thin film deposition [10, 11]. Self-diffusion of Fe in $\text{Fe}_{85}\text{Zr}_{15}$ alloy was also studied in the amorphous state (using neutron reflectivity) and nanocomposite state (using SIMS) [12]. Fe self-diffusion in nanocrystalline FeN prepared using pulsed laser deposition technique was also studied [13].

Nuclear resonant reflectivity of synchrotron radiation (NRR of SR) is a complementary technique to neutron reflectivity for probing self-diffusion mechanism. NRR of SR was proposed [3] and applied successfully *for the first time* to probe Fe self-diffusion in nanocrystalline FeN(Zr) [14]. Very recently, I used neutron reflectivity technique for probing Fe and N self-diffusion in amorphous FeN [15]. In this work multilayers with structures [$\text{FeN}/^{57}\text{FeN}$] and [$\text{FeN}/\text{Fe}^{15}\text{N}$] were prepared and studied.

Along with probing self-diffusion, thin films of amorphous and nanocrystalline alloys were studied from the point of view of their structure and magnetism. Crystallization behavior of amorphous $\text{Fe}_{85}\text{Zr}_{15}$ alloy revealed formation of a nanocomposite state with thermal treatment. Structural and soft-magnetic properties of this alloy were studied [16].

It is known that microstructure of the films can be tailored using reactive nitrogen sputtering. In a recent study thin films of Fe and permalloy ($\text{Ni}_{80}\text{Fe}_{20}$) were prepared using reactive nitrogen sputtering by varying the nitrogen partial pressure (R_{N_2}) in the range of $0 \leq R_{N_2} \leq 100$. It was found that at lower R_{N_2} , reactive nitrogen occupies interstitial sites in the structures of *bcc* Fe and *fcc* NiFe and a nanocrystalline structure is obtained which gradually forms an amorphous structure and on further increasing the R_{N_2} energetically favored nitrides of Fe and NiFe were obtained which again form an amorphous or nanocrystalline structure at still higher R_{N_2} [17].

Along with the above-mentioned properties, growth of an amorphous film is very interesting due to lack of long range periodicity and spatially isotropic nature of amorphous phase. Dynamical scaling of roughness can be entirely different as compared with their crystalline counterpart. Growth behavior of amorphous FeZr film was studied and it was found that on increasing the thickness of the films beyond a critical point a crossover occurs in the growth exponent which can be described with the changes in the microstructure with the thickness [18].

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- [1] *Self-Diffusion of Iron in Amorphous Iron Nitride*, Mukul Gupta, A. Gupta, S.Rajagopalan and A. K. Tyagi, **Phys. Rev. B** 65, 214204 (2002).
 - [2] *Microstructural Study of Iron Nitride Thin Film Deposited by Ion Beam Sputtering*, Mukul Gupta, A. Gupta, S.M. Chaudhari, D.M. Phase, V. Ganesan, B. A. Dasannacharya et al, **Vacuum** 60, 399 (2001).
 - [3] *Pure Nuclear Reflections from $^{nat}\text{FeN}_{0.7}/^{57}\text{FeN}_{0.7}$ Multilayer*, A. Gupta, Mukul Gupta, B. A. Dasannacharya, S. Kikuta, Y. Yoda, M. Seto, **J. Phys. Soc. Jpn.** 73, 423-429 (2004).
 - [4] *Study of Iron Nitride Thin Films Deposited by Pulsed Laser Deposition*, Mukul Gupta, A. Gupta, P. Bhattacharya, P. Misra and L. M. Kukreja, **J. Alloys and Compounds** 326, 265-269 (2001).
 - [5] *Development of an Ion Beam Sputtering System for Depositing Thin Films and Multilayers of Alloys and Compounds*, Mukul Gupta, A. Gupta, D.M. Phase, S.M. Chaudhari, and B. A. Dasannacharya, **Applied Surface Science** 205, 309-322 (2003).
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- [9] *Iron self-diffusion in amorphous FeZr/⁵⁷FeZr multilayers by neutron reflectometry*, **Mukul Gupta**, A. Gupta, J. Stahn, M. Horisberger, T. Gutberlet, P. Allenspach, **Phys. Rev. B** 70, 184206 (2004).
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- [11] *Iron self-diffusion in nanocomposite FeZr alloys measured by neutron reflectivity: Effect of applied compressive stress*, **Mukul Gupta**, A. Gupta, S. Chakravarty, T. Gutberlet, *being communicated to* **Phys. Rev. B**.
- [12] *Iron Self-Diffusion in Nanocrystalline FeZr Films*, A. Gupta, **Mukul Gupta**, S. Rajagopalan, A. K. Balamurgan and A. K. Tyagi, U. Pietsch, S. Ayachit **J. Non-Crystalline Solids** 343, 39-47 (2004).
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- [14] *Fe Diffusion in Amorphous and Nanocrystalline Alloys using Nuclear Resonance Reflectivity*, A. Gupta, **Mukul Gupta**, S. Chakravarty, R. Rüffer, H.-C. Wille, O. Leupold, **Phys. Rev. B** 71, In-press (2005).
- [15] *Self-diffusion measurements in iron-based chemically homogeneous multilayers using Nuclear Resonance and Neutron reflectivity*, **Mukul Gupta**, A. Gupta, S. Chakravarty, R. Rüffer, H.-C. Wille, O. Leupold, **Proc. MRS** 840, Q1.7.1 (2005).
- [16] *Structural and magnetic properties of ion-beam sputtered FeZr thin films*, **Mukul Gupta**, A. Gupta, **Physica Status Solidi C1**, 3211 (2004).
- [17] *Nanocrystallization and Amorphization Induced by Reactive Nitrogen Sputtering in Iron and Permalloy*, R. Gupta and **Mukul Gupta** **Phys. Rev. B** 71, In-press (2005), **arXiv cond-mat/0412657**, accepted as an oral presentation at **Nanotech 2005** conference (California, U.S.A.).
- [18] *Crossover in Growth Exponent upon Nanocrystallization of Amorphous Thin Film*, **Mukul Gupta**, *J. Appl. Phys.*, *Communicated*.