---------BIO-DATA--------

Dr. SATNAM SINGH BHAMRA
B.Sc, M.Sc, Ph.D (Physics)
Assistant Professor
Department of Physics
Maharaja Ranjit Singh Punjab Technical University
Bathinda-151001(Punjab)
Mobile : +917986595372
E-mail: satnam@mrsptu.ac.in
satnambhamra@hotmail.com

ORICD ID: https://orcid.org/0000-0002-9240-3602
Scopus Author ID: 57845939800

Professional Experience

Duration	Position	Affiliation
19August2016 -to- Continue.	Assistant Professor	Maharaja Ranjit Singh Punjab Technical University, Punjab
17April2014 -to-17August2016.	Assistant Professor	Baba Farid College, Bathinda, Punjab
08 April 2011 -to- 07 April 2014	CSIR-Senior Research Fellow (CSIR-S.R.F)	CSIR-National Metallurgical Laboratory, Jamshedpur
19 July 2007 –to-07 April 2011	Project Assistant (P.A)	CSIR-National Metallurgical Laboratory, Jamshedpur

Details of Administrative Responsibilities:

Sr. No	Nature of Duty	Duration	Office order No
1.	Assistant Dean Academic Affairs	03/08/2021 to Continuing	Uni/Estb/290/1987 dated 03/08/2021
2.	Co-Nodal Officer all the UGC Scholarship Schemes	29/10/2021 to Continuing	DAA/MRSPTU/2018/2205 dated: 29/10/18
3.	Off campus warden (Boys)	13/07/2020 to cont.	Uni/Estb/216/1475 dated 13/07/2020
4.	Co –coordinator SIP cum UNV cell of the University	24/02/2020 to 05/08/2021	Ref. 663 dated 24/02/20202
5.	Cultural Coordinator	22/03/2021 to 22/09/2022	Uni/ Estb/115/905 dated: 22/03/2021, Uni/Estb/364/2890 dated 22/09/22
6.	Co-coordinator UBA	11/09/19 to Cont.	Ref.4249 date 11/09/19

Publications / Patents / Presentations:

Research Projects (Minor)	: 02
Publications in International Journals	: 13
Publications in National Journals (Indian)	: 02
Presentations in Seminar /Conference	: 04
Workshop and training programs	: 02

PhD Details:

Title of thesis	:	Studies on Magnetic Field Induced Strain and Phase Transformation in Rapidly Solidified NiMnGa and CoNiAl Ferromagnetic Shape Memory Alloys.
PhD Supervisors	:	Dr. A.K. Panda (Senior Scientist, NML Jamshedpur) Prof. N.B. Manik (Associate Professor, Jadavpur University, Kolkata)
University Name	:	Jadavpur University, Kolkata (India).
Registration Date	:	03/08/09
Thesis defended	:	09/04/2014
Award Date	:	28/05/2014
PhD Course Work	:	Indian Association for Cultivation of Science
Subjects	:	Advanced Solid State Physics Review and Research Methodology

Academic Qualifications

Degree	University/ college/ board	Year of Passing	% of Marks	Division	Subjects
Ph.D	Jadavpur, University Kolkata	May 2014	-	-	Physics
MSc.	MDU, Rohtak	February 2005	62.62	1st	Physics
BSc.	MDU, Rohtak	June 2003	65.17	1st	Physics, Statistics and Maths
10+2	BSEH	June 1999	55	2nd	Physics, Chemistry, Maths, Hindi and Eng.
10th	BSEH	June 1997	57	2nd	Science, Maths, Hindi, English, SST.

Involvement in Research Projects:

Studies on Effect of Sn as dopant in FeMnGe and CoMnGe based magnetocaloric materials. Sponsored by: Department of Science and Technology (C.V: 12.55 lakhs). Duration: 2016-2019. Status: Completed

Development of NiMnGa based Ferromagnetic Shape Memory Alloys by melt spinning route. Sponsored by: In-House Project Support Group, CSIR-NML, Duration: 01-04-2011 to 31-03-1013, Status: Completed.

Awards Honours and Recognitions:

- CSIR- Senior Research Fellowship for the year 2011 to 2013 via CSIR file No: 31/10/46/2011/EMR-I.
- National **Level Exams JEST**-2008 **Qualified** with 90.17 percentile and 432 all India rank.
- Second prize in poster presentation for paper entitled "*Influence of Rapid Quenching and Heat treatment on Melt Spun NiMnGa based Ferromagnetic Shape Memory Alloys*" by **Satnam Singh**, R.K. Roy, M. Ghosh, A. Mitra and A.K. Panda at the 50th NMD and 66th Annual Technical Meeting of Indian Institute of Metals held at Jamshedpur on 16-19 Nov. 2012.
- First prize in Metallographic contest for paper entitled "*Effect of Al incorporation on the martensite transformation in $Ni_{55}Mn_{22}Ga_{23}$ (At%) Ferromagnetic Shape Memory Alloy*" by **Satnam Singh**, R.K.Roy, M.Ghosh, A. Mitra and A.K. Panda at 49th NMD and 65 Annual Technical Meeting of Indian Institute of Metals held at Hydrabad on 14-16Nov, 2011.
- First prize in Metallographic contest for paper Magnetic and Structural Properties of Rapidly Solidified $Ni_{77-x}Mn_xGa_{23}$ (X= 22 to 29) Ferromagnetic Shape Memory Alloys" by **Satnam Singh**, RK Roy, M Ghosh, A Mitra and AK Panda at 48th NMD and 64th Annual Technical Meeting of Indian Institute of Metals held at IISc Bangalore, 14-16Nov, 2010.

Tanning Programs/ Workshops Attended:

Participated in training program organized by UGC-DAE consortium for Scientific Research, Mumbai Centre and Solid State Physics division, BARC, entitled "School *on Neutrons as Probes of Condenced Matter NPCM-XIV*" held at Bhabha Atomic Research Centre, Mumbai India during 5-10 October 2009.

Areas of Research Interest:

Multi-Ferroic Material, Electro-caloric Materials, Full Cell, Ferromagnetic Shape Memory Alloys, Magneto-caloric Materials, Spintronic materials, Nano-structured and advanced magnetic materials, Amorphous Alloys

Areas of Teaching Interest:

Condensed Matter Physics, Material Science, Nano-Technology and Nano-Physics, Classical Mechanics, Electrodynamics

Experience:

Research Experience:

(i) ***Nano-Structured and advanced materials:*** I have worked in the field of bilayered ribbons with layer of FeNbSiB and CoSiB alloys, Brazing material (CuMnNi) prepared by melt spinning technique, soft magnetic materials (like FeSiB, CoSiB etc.), Materials revealed Giant Magneto Impedance properties (CoFeNbSiB), Magneto-caloric materials (NiMnGa and NiMnGaAl).

(ii) ***Material characterisations:*** Expertise in handling and data analysis form the instruments: Vibrating Sample Magnetometer (VSM), Magnetic Hysteresis tracer, Differential Scanning Calorimeter (DSC), Thermal variation of Electrical Resistivity (TER), optical microscopy, x-ray diffractometer (XRD). Also know sample preparation and data analysis for Transmission Electron Microscope (TEM).

(iii) ***Developed Device:*** A device have been developed for direct measurement of Magnetic Field Induced Strain / magneto-striction of Ferromagnetic Shape Memory Alloys (FSMA's) / magneto-strictive materials in the shape of ribbons and wires.

(iv) ***Software's and Platforms:*** Sound knowledge of Microsoft Office, PDF, LateX, EndNote, Adobe PhotoShop, LabView MatLab, JCPCS-PDF, MAUD, FullProof etc.

(v) ***Ph.D Work:*** My Ph.D. research focused on Ferromagnetic Shape Memory Alloys (FSMAs), which are renowned for their large magnetic field-induced strain and find applications as actuator materials. Traditionally, these materials have been prepared using expansive crystal growth techniques. However, the final material size is often restricted by crystal dimensions, and there is a possibility of crystal defects.

To address these challenges, I investigated two alloy systems: NiMnGa and CoNiAl. These alloys were prepared in a series using the Rapid Solidification route via Melt Spinning technique. Melt Spinning has the potential to alter mechanical, magnetic, transformation, and structural properties.

Specifically, I targeted improvements in Magnetic Field Induced Strain (MFIS) and phase transformation. Initially, I prepared alloys with the nominal composition Ni77-xMnxGa23 (X= 22, 23, 24, 25, 27, 29) (at %) These alloys exhibited an increase in martensitic transformation temperature (MT) as Mn concentration decreased. Transmission Electron Microscopy (TEM) investigations revealed systematic changes in ribbon morphology from austenite to martensite with decreasing Mn content. Notably, the alloy with X=22 showed high MFIS, which was further enhanced through heat treatment.

Additionally, I investigated $Co_{64-Z}Ni_{36}Al_Z$ (at%, Z=23, 24, 26 and 28) melt spun ribbons. These alloys exhibited β- and γ-phase structures, with the volume fraction varying based on Al content. The γ-rich (low Al) alloys displayed magnetically soft phases, while the Co-depleted high Al alloys showed reduced magnetization and Curie temperatures. Notably, the low Al alloy (X=23) exhibited high magneto-strain, which decreased significantly with increasing Al content. These features were correlated with low dislocation density and a feebly strain-twined structure.

Comparing the properties of melt-spun ribbons to bulk materials prepared via conventional melting-casting routes, the ribbons showed superior behavior. While bulk alloys exhibited features of high dislocation and lattice strain associated with a single martensite phase, the ribbons revealed a small fraction of austenite phase within the martensite matrix, resulting in high magneto-strain values.

Publications in International Journals

[1] P. Dhuria, S. S. Bhamra, J. S. Hundal,"Evolution of conduction mechanism in Ca-doped YFe0.5Co0.5O3 compound by complex impedance spectroscopy" *Ceramics International* **2024**, https://doi.org/10.1016/j.ceramint.2024.02.172.

[2] P. Dhuria, S. S. Bhamra, J. S. Hundal,"The study of Correlated Barrier Hopping (CBH) conduction mechanism and modulus spectroscopy of YFe0.5Co0.5O3 compound" *Physica B: Condensed Matter* **2024**, 677, https://doi.org/10.1016/j.physb.2024.415696.

[3] A. Sethi, S. Khan, K. Singh, S. Singh Bhamra,"Electrocaloric, thermal and structural properties of $Ba_{1-x}Li_xTi_{0.975}V_{0.025}O_{3\pm\delta}$ ($0 \leq x \leq 0.05$) ceramics" *Materials Science and Engineering: B* **2024**, 299, https://doi.org/10.1016/j.mseb.2023.116989.

[4] P. Dhuria, S. S. Bhamra,"Influence of LTSSR and HTSSR synthesis methods on the structural properties of $YFeO_3$ orthoferrite" *Materials Science and Engineering: B* **2022**, 285, https://doi.org/10.1016/j.mseb.2022.115960.

[5] S. Dey, S. Singh, R. K. Roy, M. Ghosh, A. Mitra, A. K. Panda,"Influence of Mn incorporation for Ni on the magnetocaloric properties of rapidly solidified off-stoichiometric NiMnGa ribbons" *Journal of Magnetism and Magnetic Materials* **2016**, 397, 342, https://doi.org/10.1016/j.jmmm.2015.08.102.

[6] A. K. Panda, S. Dey, R. K. Roy, S. Singh, A. Mitra,"Influence of phase transformation on interfacial activity and bend sensitivity of rapidly quenched $Fe_{77.5}Si_{7.5}B_{15}$/$Co_{72.5}Si_{12.5}B_{15}$ bilayered magnetostrictive ribbons" *Journal of Magnetism and Magnetic Materials* **2015**, 378, 440, https://doi.org/10.1016/j.jmmm.2014.11.077.

[7] S. Singh, R. K. Roy, B. Mahato, M. Ghosh, A. Mitra, A. K. Panda,"Effect of Al incorporation for Co on the gamma-beta phase boundary of rapidly solidified CoNiAl ferromagnetic shape memory alloys" *Journal of Magnetism and Magnetic Materials* **2014**, 368, 379, https://doi.org/http://dx.doi.org/10.1016/j.jmmm.2014.05.053.

[8] S. Singh, R. K. Roy, M. Ghosh, A. Mitra, A. K. Panda,"Martensitic transformation and magneto-strain in melt spun NiMnGaAl Ferromagnetic Shape Memory Alloys" *Intermetallics* **2013**, 43, 147, https://doi.org/10.1016/j.intermet.2013.07.018.

[9] A. K. Panda, R. K. Roy, S. Dey, S. Singh, A. Mitra,"Functional gradation through preferential crystallisation and interfacial activity in rapidly quenched Fe/Co-based bilayered ribbons for bend sensors" *Journal of Applied Physics* **2013**, 114, 023909, https://doi.org/10.1063/1.4813222.

[10] S. Singh, R. K. Roy, M. Ghosh, N. B. Manik, A. Mitra, A. K. Panda,"Modification in martensite morphology and magneto-strain through rapid solidification and heat treatment of NiMnGaAl alloy" *Journal of Magnetism and Magnetic Materials* **2013**, 343, 169, https://doi.org/http://dx.doi.org/10.1016/j.jmmm.2013.05.005.

[11] S. Singh, R. K. Roy, M. Ghosh, A. Mitra, A. K. Panda,"Heat treatment induced martensitic accommodation and adaptive anisotropy in melt spun $Ni_{55}Mn_{22}Ga_{23}$ (at. %) ribbons" *Journal of Applied Physics* **2012**, 112, 103512, https://doi.org/10.1063/1.4765739.

[12] R. K. Roy, S. Singh, M. K. Gunjan, A. K. Panda, A. Mitra,"Joining of 304SS and pure copper by rapidly solidified Cu-based braze alloy" *Fusion Engineering and Design* **2011**, 86, 452, https://doi.org/10.1016/j.fusengdes.2011.04.002.

[13] A. K. Panda, S. Singh, S. K. Das, A. Mitra, M. Koblischka, B. Jamieson, S. Roy,"Effect of magnetizing field on the martensitic transformations in a melt spun NiMnGa alloy" *Journal of Physics D: Applied Physics* **2009**, 42, 245004, https://doi.org/10.1088/0022-3727/42/24/245004.

[14] A. K. Panda, S. Singh, R. K. Roy, M. Ghosh, A. Mitra,"Effect of Mn incorporation for Ni on the properties of melt spun off-stoichiometric compositions of NiMnGa alloys" *Journal of Magnetism and Magnetic Materials* **2011**, 323, 1161, https://doi.org/http://dx.doi.org/10.1016/j.jmmm.2010.12.035.

Publications in National Journals

[1] **Satnam Singh**, A.Mitra, A.K.Panda "Magnetic and Structural Evolution in Ni-rich off-stoichiometric NiMnGa Melt Spun Ribbons" *J. Met & Mat. Sc, 51,3(2009)197, ISSN : 0947-126).*

[2] A.K. Panda, **Satnam Singh**, Rajat Kumar Roy, Mainak Ghaosh and Amitava Mitra, Ferromagnetic Shape Memory Alloys (FSMAs) for Magneto-Mechanical Applications, *Journal of Science and Culture* 78(11-12) (2012) 577-579.

Presentation in International Seminar /Conference:

Satnam Singh, A.Mitra, M.Ghosh and A.K.Panda "Ferromagnetic shape memory Transitions in NiMnGa based melt spun ribbons", *International conference on Magnetic materials and their applications for 21st century [MMA-21], Oct 21- 23, 2008, NPL, New Delhi*

Presentations in National Seminar /Conference

Satnam Singh, M.Ghosh, RK Roy, A Mitra and AK Panda, "Effect Influence of Rapid Quenching and Heat treatment on Melt Spun NiMnGa based Ferromagnetic Shape Memory Alloys" *50th NMD and 66th ATM, Indian Institute of Metals Jamshedpur-chapter, 16-19 Nov. 2012.*

Satnam Singh, RK Roy, M.Ghosh, A Mitra and AK Panda, "Effect of Al incorporation on the martensite transformation temperature in $Ni_{55}Mn_{22}Ga_{23}$ ferromagnetic shape memory alloy" *49th NMD 65th ATM, Indian Institute of Metals Hydrabad-chapter, 14-16Nov, 2011.*

Satnam Singh, A.K. Panda, A Mitra, "Development of NiMnGa based Ferromagnetic Shape Memory Alloy by Melt spinning Technique" *National symposium for research scholars, IIT Bombay, May 17-18, 2008.*

Personal Details:

Name	:	Satnam Singh
Father's Name	:	Sh. Harjinder Singh
Date of Birth	:	September 25, 1980
Gender	:	Male
Marital Status	:	Married
Religion	:	Sikh
Nationality	:	Indian
Address for Correspondence	:	Satnam Singh Bhamra H.No-43 Suncity Enclave, Badal Road, Bathinda, Punjab-151001 (India)

(Dr. SATNAM SINGH BHAMRA)