MIHAELA TANASE

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OBJECTIVE

To obtain a tenure-track position in which to leverage my extensive experience in nanomagnetism and metrology to build a world-class research group in the area of magnetism of thin film heterostructures and devices, and to teach and train young scientists to the highest standards

EDUCATION

Carnegie Mellon University
PhD Physics, Data Storage Systems Center & Physics Department (with Prof. D.E. Laughlin and J.-G. Zhu, supervisors, 2005)
MS Physics, Physics Department (2001)
University of Bucharest
MS Condensed Matter Physics and Technology, Physics Department (1999)
BS Physics, Physics Department (1997)

EXPERIENCE

Argonne National Laboratory, *Postdoctoral Researcher (with AK Petford-Long, 12/05 – now)*
Characterization of microstructure-property relationship in lithographically-patterned magnetic nanostructures exhibiting vortex magnetization for MRAM applications, using Lorentz Electron Microscopy. Designed and implemented a sample preparation process with aligned double-sided lithography. Characterized magnetic reversal and microstructure in single-layered ferromagnetic (FM) nanostructures of CoFe and NiFe. Produced and characterized for the first time exchange bias in circular devices of bilayered ferromagnetic /antiferromagnetic (FM/AF, AF=IrMn) nanostructures. Compared magnetic reversal and preparation-induced microstructural changes in FIB-patterned vs. electron-beam patterned magnetic nanostructures with and without exchange-bias.

Data Storage Systems Center, Carnegie Mellon University, *graduate student (2001-2005).*
Ph D thesis: '*$L1_0$ Self-Assembled FePt Nanoparticles for Ultrahigh Density Perpendicular Magnetic Data Storage*'
Developed process for fabrication of $L1_0$ self-assembled FePt nanoparticles by thermal annealing *without nanoparticle sintering*, an essential condition for producing self-assembled media. Performed first measurements of the dependence of the long range order (LRO) parameter on the true monodispersed nanoparticle size and thermal processing parameters. Demonstrated discontinuous character of the order-disorder transformation down to 5 nm diameter. Proved that the ordering transformation in nanoparticles takes place at the subcritical nucleus size for ordering (3 nm).

Seagate Research, Pittsburgh PA, *Intern (with Dr. Dieter Weller, 2002).*
Technology transfer and scale-up of nanoparticle production from research setting to development for SOMA project (Self-Organized Magnetic Arrays for Ultra-High Density Magnetic Data Storage). Produced for the first time in Seagate labs self-assembled, monodispersed FePt nanoparticles and characterized them by Transmission Electron Microscopy (TEM), X-ray Diffraction (XRD) and magnetometry.

Carnegie Mellon University, Physics Department, *teaching assistant (1999 – 2001).*
Conducted weekly recitations and exam review sessions, assisted students in laboratory experiments, and taught Physics I for Engineers, Physics II for Science, and Experimental Physics Laboratory.

Carnegie Mellon University, Physics Department, *graduate student (1999 – 2001).*
Research project: *Self-Assembled Surfactant-Functionalized FePt Nanoparticles for Magnetic Data Storage.* Successfully prepared monodispersed FePt nanoparticles with controlled composition, fcc structure and tight (5%) size distributions suitable for data storage applications. Used surfactant coating and exchange to optimize self-assembly.

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University of Bucharest, Romania, Physics Department *graduate student (1997-1999).*
MS Thesis: *'Band-Structure Simulations in ZnO:H Doped Bidimensional Quantum Wells.'*
Performed a self-consistent modeling of the band structure of the inversion layer ZnO:H produced by hydrogen adsorption or ion implantation. Introduced the exchange interaction in the one-electron approximation previously used by the algorithm and ascertained its effects on the shape of the potential well, on the energy levels and their occupation numbers, for a series of ionic implantation profiles.

University of Bucharest, Physics Department, *undergraduate student (1993-1997).*
BS Thesis in collaboration with the National Institute for Materials Physics Bucharest:
'Electrical Properties of Aluminum Nitride Sputtered Thin Films.'
Prepared RF-sputter deposited AlN/ITO thin films, performed XRD structural investigation, measured transient I-V curves; identified the conduction type (hopping / extended states) as a function of the deposition parameters (pressure, gas type, deposition temperature); constructed a model for the band structure of the ITO-AlN heterojunction that successfully explained the transient I-V curves.

AWARDS

University of Bucharest Merit Scholarship, 1997-1999 (top 5% of graduate students)
University of Bucharest Undergraduate Merit Scholarship, 1993-1997 (top 5%)

PROPOSALS WON

M Tanase, K Buchanan, V Novosad, A K Petford-Long, "Thin Film Magnetic Heterostructures", Center for Nanoscale Materials User Facility Proposal #CNM-185, 2006 and CNM-505, 2007, Argonne National Laboratory
M Tanase, A K Petford-Long, "Quantitative In-Plane Magnetization Mapping in Lithographically-Patterned Magnetic Nanostructures", **Electron Microscopy Center User Facility Proposal #060109-01A, Argonne National Laboratory, 2006-2008**

AFFILIATION

IEEE Member
IEEE Magnetics Society Member
IEEE Women in Engineering Member

OUTREACH

Science Careers in Search of Women Conference, Argonne National Laboratory, 2008
Introduce a Girl to Engineering Day (IGED), Argonne National Laboratory, 2007

OTHER

Languages: english, spanish & romanian (fluent)
Hobbies: ski/skating, biking, camping, argentine tango

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PUBLICATIONS

M Tanase, A K Petford-Long, O Heinonen, K S Buchanan, J Sort, J Nogués, "Magnetic reversal in patterned nanostructures with circular exchange-bias", submitted to **Physical Review B**

C Phatak, M Tanase, A K Petford-Long, M De Graef, "Simultaneous determination of vortex polarity and chirality from single Fresnel images", submitted to **Ultramicroscopy**

M Tanase, A K Petford-Long, "In-Situ Electron-Optical Observations of Magnetic Materials", invited review paper, accepted in **Microscopy Research and Techniques**

S Núñez-Sánchez, R Serna, A K Petford-Long, M Tanase, "The role of the laser fluence on the Al2O3 target in the nanostructure and morphology of VOx:Al2O3 thin films prepared by pulsed laser deposition" **Appl Surf Sci** vol 254(4), 2007, pp 1316-1321

M Tanase, J -G Zhu, C Liu, N Shukla, T J Klemmer, D Weller, D E Laughlin, "Structure Optimization of FePt Nanoparticles of Various Sizes for Magnetic Data Storage", **Metall Mat Trans** vol 38A, 2007, 798-810

D E Laughlin, K Srinivasan, M Tanase, L Wang, review paper "Crystallographic aspects of L10 magnetic materials", **Scripta Mat** vol 53/4, pp 383-388 (2005)

C Liu, X Wu, T J Klemmer, N Shukla, D Weller, A G Roy, M Tanase, D E Laughlin, "Reduction of Sintering during Annealing of FePt Nanoparticles Coated with Iron Oxide", **Chem Mater** 17 (3), 620-625, 2005

C Liu, X Wu, T Klemmer, N Shukla, X Yang, D Weller, A G Roy, M Tanase, D E Laughlin, "Polyol Process Synthesis of Monodispersed FePt Nanoparticles", **J Phys Chem B** 108 (20), 6121-6123, 2004

M Tanase, N T Nuhfer, D E Laughlin, T J Klemmer, C Liu, N Shukla, X Wu, D Weller, "Crystallographic Ordering Studies of FePt Nanoparticles by High-Resolution Electron Microscopy", **J Magn Magn Mat** 266 (1-2), 215-226, 2003

T J Klemmer, C Liu, N Shukla, X Wu, D Weller, M Tanase, D E Laughlin, W A Soffa, "Combined reactions associated with L10 ordering", **J Mag Mag Mat** 266 (2003), 79-87

C Liu, T J Klemmer, N Shukla, X Wu, D Weller, M Tanase, D E Laughlin, "Oxidation of FePt nanoparticles "**, J Mag Mag Mat** 266 (1-2), 96-101, 2003

X Wu, H Zhou, R J M van de Veerdonk, T J Klemmer,C Liu, N Shukla, D Weller, M Tanase and D E Laughlin, "Studies of switching field and thermal energy barrier distributions in a FePt nanoparticle system", **J Appl Phys** 93 (10), 7181-7183, 2003

T J Klemmer, N Shukla, C Liu, X Wu, E B Svedberg, O Myrasov, R W Chantrell, D Weller, M Tanase and D E Laughlin, " Structural studies of $L1_0$ FePt nanoparticles", **Appl Phys Lett** 81 (12), 2220-2222, 2002 **(57 citations to present)**

CONFERENCE AND INVITED TALKS

M Tanase, A K Petford-Long, M De Graef, K Buchanan, J Sort, J Nogués, "Magnetization Reversal in Nanostructures with Circular Exchange Bias", **INTERMAG May 4-8th 2008, Madrid, Spain**

M Tanase, D K Schreiber, A K Petford-Long, O G Heinonen, J Sort, invited talk (given by D Schreiber) "Vortex Behavior in Patterned Magnetic Heterostructures with Circular Exchange Bias", **The Advanced Photon Source, Center for Nanoscale Materials and the Electron Microscopy Center Joint Users Meeting, Argonne National Laboratory, May 5-9th, 2008**

M Tanase, A K Petford-Long, M De Graef, K Buchanan, J Sort, "Magnetization Reversal in Exchange-Biased Nanostructures", invited talk, **University of Michigan Ann Arbor, CM/AMO Seminar, Dec. 11, 2007**

M Tanase, A K Petford-Long, M De Graef, K Buchanan, J Sort, "Exchange-Biased Magnetic Heterostructures", **52nd Magnetism and Magnetic Materials Conference, Nov. 5-9th, Tampa FL 2007**

C Phatak, M Tanase, A K Petford-Long, M De Graef, "Vortex characterization using Lorentz Transmission Electron Microscopy", **52nd Magnetism and Magnetic Materials Conference, Nov. 5-9th, Tampa FL 2007**

A K Petford-Long, A N Chiaramonti, M Tanase and D K Schreiber, contribution to invited talk "*In-situ* TEM Studies of Magnetization Reversal and Transport in Magnetic

Nanostructures", **Frontiers in Electron Microscopy in Materials Science (FEMMS), Rohnert Park, CA, Sept. 24-28, 2007**

A K Petford-Long, B Kabius, A Chiaramonti, M Tanase, L Thompson, J Hiller, M Scheef, N Salmon, E Stach, W Egelhoff, contribution to invited talk "*In-Situ* TEM Studies of Thin Film Oxide Heterostructures", **University of Chicago Review of the Materials Science Division, Argonne National Laboratory February 26-28, 2006**

M Tanase, A K Petford-Long, A Chiaramonti, C Sudbrack, D Schreiber, invited talk "Lorentz Microscopy of Patterned Magnetic Thin Film Heterostructures", **Universidad Autonoma de Barcelona, Bellaterra, Spain, July 22nd 2006**

M Tanase, J-G Zhu, C Liu et al., presented by D E Laughlin, "Structure optimization of FePt nanoparticles of various sizes for magnetic data storage", **Conference on Phase Transformations in Magnetic Materials, TMS Annual Meeting, San Antonio TX, March 12-14th, 2006**

M Tanase, N Shukla, C Liu, T J Klemmer, D E Laughlin, D Weller, invited talk "$L1_0$ ordered self-assembled FePt nanoparticles ", **Carnegie Mellon University, Data Storage Systems Center Spring Review 2003**

M Tanase, N Shukla, C Liu, T J Klemmer, D E Laughlin, D Weller, "Small Ordered Nanoparticles", $L1_0$ Ordered Intermetallic and Related Phases for Permanent Magnet and Recording Applications, Copper Mountain, Colorado, 2004

M Tanase, N Shukla, C Liu, T J Klemmer, D E Laughlin, D Weller, "Electron Beam Irradiation of FePt Nanoparticles", **XIIth International Materials Research Congress, Cancun Mexico 2003**

D Weller, T Klemmer, N Shukla, C Liu, J Achner, M Tanase and D E Laughlin, contribution to invited talk "Prospects of FePt Nanoparticle arrays for Magnetic or Probe Media Applications", **Connections Workshop on Probe Storage, Enschede, Netherlands, 2002**

M Tanase, N Shukla, C Liu, T J Klemmer, D E Laughlin, D Weller, "Crystallographic Ordering Studies of FePt Nanoparticles using High Resolution Electron Microscopy", **4th International Conference in Fine Particle Magnetism (ICFPM), Seagate Research, Pittsburgh, Aug 14-16th, 2002**

M Tanase, O Crisan, D Jianu, "Structural Investigations on $Sm_xFe_{80-x}B_{20}$ Ternary Alloys Exhibiting Exchange-Spring Magnetism", **"Physique en Herbe" European Conference for Ph.D. Students, Rouen, France 1998**

M Tanase, V Stoica, C Nita, "Electrical Properties of Sandwich Structures with Aluminum Nitride Layers", **IEEE International Conference on Semiconductors, Sinaia, Romania 1998**

M Tanase , "Band-Structure Simulations of a ZnO:H Doped Bidimensional Quantum Well", **Annual Session of Communications of the University of Bucharest, Romania 1998**

SKILLS

Materials synthesis and nanofabrication

Wet chemistry: chemical (polyol) / sonochemical nanoparticle synthesis

Electron lithography (Raith 150 and JEOL JBX-9300FS), optical lithography (Suss MA6/BA6 Double-Sided Contact Mask Aligner, optical and electron resist pre- and post-processing, anisotropic Si etch, reactive ion etching (RIE, DRIE), broad ion beam, rapid thermal annealing (RTA)

RF- and DC- thin film sputtering, reactive magnetron sputtering

Langmuir-Blodgett devices

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Characterization techniques

Transmission and High Resolution Electron Microscopy (TEM, HREM / HRTEM), Lorentz TEM, analytical electron microscopy (EDS/EDAX, EELS), Scanning Electron Microscopy (SEM) and related sample preparation techniques

Superconducting Interference Quantum Magnetometry (SQUID), Vibrating Sample Magnetometry (VSM)

X-Ray diffractometry

Phase reconstruction techniques for magnetic and high resolution phase reconstruction (Transport of Intensity-based software from IATIA (QPt) and Carnegie Mellon University)

Design and simulation

Micromagnetics simulation software package Landau-Lifshitz-Gilbert (LLG)
CAD design for microelectronics industry (Raith 150, L-Edit, Layout)

Miscellaneous

Gloveboxes, high-vacuum systems

REFERENCES

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