

Richard H. Kodama

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RESEARCH INTERESTS

- Magnetism of nanostructures, e.g. magnetic relaxation, spin dynamics, surface/interface magnetic anisotropy, interfacial exchange coupling, and magnetoelastic anisotropy
- Magnetotransport studies of magnetic nanoparticles and nanojunctions, magnetic noise
- Reactive sputter synthesis of insulating and semiconducting metal-oxide films
- Structural and electrical characterization of II-VI semiconductor superlattices
- Computational studies of magnetic and electrical properties of nanostructures

EDUCATION

University of California, San Diego
Ph.D. in Physics 1997, M.S. in Physics 1991
Dissertation: *Finite Size and Interface Effects in Magnetic Oxide Nanoparticles and Films*

University of Washington
B.S. in Physics 1990, Magna Cum Laude

EMPLOYMENT

University of Illinois at Chicago, Department of Physics, Chicago, IL
Assistant Professor 8/00 – present

National Research Council / Naval Research Lab, Washington, DC
Research Associate (Advisors: Dr. Alan S. Edelstein, Dr. Vincent G. Harris) 8/97 – 7/00

University of California, San Diego, Department of Physics, La Jolla, CA
Research Assistant (Advisor: Prof. Ami. E. Berkowitz) 6/91 - 6/97
Teaching Assistant 9/90 - 6/91, 1/97-6/97

National Institute for Standards and Technology, Gaithersburg, MD
Cooperative Education Intern (Advisor: Dr. Gerald V. Blessing) 6/88 - 12/88

EDUCATION & OUTREACH ACTIVITIES

Teaching undergraduate courses in mechanics, waves & thermal physics, and electricity and magnetism (UIC, '00 - '06). Research advisor for four undergraduate students, three graduate students and a postdoc. Co-director of undergraduate studies for Dept. of Physics. Collaborating with Chicago Museum of Science & Industry on exhibit concepts ('04 - '06). Physics instructor for UIC Saturday College academic enrichment program (UIC, '00-'02). Teaching assistant for classes in mechanics, electricity & magnetism, and thermodynamics & waves (UCSD, '90-'97).

INVITED TALKS

“Surface-Driven Effects on the Magnetic Behavior of Oxide Nanoparticles,” Ninth International Conference on Ferrites (ICF-9) 2004, San Francisco, CA.

“Magnetic Size Effects in Oxide Nanoparticles,” 10th International Conference on Magnetic Fluids 2004, Guarujá, Brazil.

- “Interfacial magnetism & other topics in nanoscale magnetism,” University of Florida, Physics Department Seminar, Jan. 2004, Gainesville, FL.
- “Interface Magnetism,” Northern Illinois University, Physics Department Colloquium, Apr. 2003, DeKalb, IL.
- “Magnetization Steps in the Quantum Treatment of the Mn-12 Spin Hamiltonian,” Magnetism and Magnetic Materials Conference 2002, Tampa, FL.
- “High-pressure sputtering for studies of nano-magnetism,” CNMS workshop on Magnetism in Nanostructured Materials, Dec. 2001, Oak Ridge, TN.
- “Magnetic Nanoparticles,” International Symposium on Research and Education in the 21st Century, Aug. 2000, Tohoku University, Sendai, Japan.
- “Role of Interfacial Uncompensated Spins in Exchange Biased $\text{Ni}_{81}\text{Fe}_{19}/\text{CoO}$ Bilayers,” MRSEC Topical Workshop on Magnetic Heterostructures, Aug. 1998, University of Wisconsin, Madison
- “Interfacial Uncompensated Spins in Polycrystalline $\text{Ni}_{81}\text{Fe}_{19}/\text{CoO}$ Bilayers,” Workshop on Antiferromagnetic Materials, Nov. 1997, University of Alabama
- “Antiferromagnetic Nanoparticles: Anomalous Properties and Modeling,” APS March Meeting 1997, Kansas City, MO
- “Surface Spin Disorder in Ferrite Nanoparticles,” Magnetism and Magnetic Materials Conference 1996, Atlanta, GA
- “Spark Erosion for Fine Particle Production,” NATO Advanced Study Institute on Nanophase Materials 1994, Corfu, Greece

OTHER SELECTED PRESENTATIONS

- “Extra magnetic transition in NiO nanoparticles,” Magnetism and Magnetic Materials Conference 2004, Jacksonville, FL
- “Finite Size Effects in Antiferromagnetic Nanoparticles,” NANO 2000, Sendai, Japan
- “Thermal Stabilization of Discontinuous Co Films by Antiferromagnetic Overlayers,” APS Centennial Meeting 1999, Atlanta, GA
- “Synthesis and Characterization of Magnetic Nanocomposite Films,” Magnetism and Magnetic Materials Conference 1998, Miami, FL
- “Role of Surface Anisotropy in Magnetic Relaxation of Ferrite Nanoparticles,” APS March Meeting 1998, Los Angeles, CA
- “Modeling of Exchange Bias in Polycrystalline $\text{Ni}_{81}\text{Fe}_{19}/\text{CoO}$ Bilayers,” APS March Meeting 1997, Kansas City, MO
- “High Field Irreversibility in NiFe_2O_4 Nanoparticles,” Magnetism and Magnetic Materials Conference 1995, Philadelphia, PA
- “Low Temperature Magnetic Relaxation in NiFe_2O_4 Nanoparticles,” Magnetism and Magnetic Materials Conference 1993, Minneapolis, MN

HONORS & PROFESSIONAL ACTIVITIES

- Pending US patent disclosure “Self-assembling molecular models using permanent magnets” 2005
- American Physical Society Member, 1990-
- Referee for Journal of Applied Physics, Physical Review B, Europhysics Letters, and Journal of Magnetism and Magnetic Materials
- Grant reviewer for National Science Foundation and Research Corporation
- Phi Beta Kappa Honor Society, 1988-
- UW Physics Department Gregory Andersen Scholarship, 1988-89
- National Merit Scholarship (four year), 1985-1989

PUBLICATIONS

AY 2005-2006

- “Evidence for Multi-Sublattice Spin States in NiO Nanoparticles,” R. H. Kodama, M. Vedpathak, J. A. Borchers, B. H. Toby, S. A. Makhlof, Submitted to Appl. Phys. Lett.
- “Structure and magnetism of Fe/Ge multilayer,” Surendra Singh, Saibal Basu, Mukul Gupta, R.H. Kodama and Mahesh Vedpathak, Submitted to J. Phys. Cond. Mat.
- “Nanoscale Suppression of Magnetization at Atomically Assembled Manganite Interfaces,” J. J. Kavich, M. P. Warusawithana, J. W. Freeland, P. Ryan, X. Zhai, R. H. Kodama, and J. N. Eckstein, Submitted to Phys. Rev. B.
- “Establishing exchange bias below T_N with polycrystalline $Ni_{0.52}Co_{0.48}O/Co$ bilayers,” A. E. Berkowitz, M. F. Hansen, R. H. Kodama, Y. J. Tang, J. I. Hong, and D. J. Smith, Phys. Rev. B **72**, 134428 (2005).

AY 2004-2005

- “Exchange Anisotropy,” (book chapter) A. E. Berkowitz and R. H. Kodama, in *Nanomagnetism: Multilayers, Ultrathin Films and Textured Media*, eds. D. L. Mills and J. A. C. Bland, (Elsevier, Oxford, 2006).
- “Surface-driven effects on the magnetic behavior of oxide nanoparticles,” (book chapter) R. H. Kodama and A. E. Berkowitz, in *Surface Effects in Magnetic Nanoparticles*, ed. D. Fiorani, (Springer, New York, 2005), pp. 189-216.
- “Ultra-thin multilayer of Fe and Ge: Structure and Magnetic properties,” Surendra Singh, Saibal Basu, M. Vedpathak, R. H. Kodama, R. Chitra, Y. Goud, Appl. Surf. Sci. **240**, 251 (2005).
- “Induced Ge spin polarization at the Fe/Ge interface,” J. W. Freeland, R. H. Kodama, M. Vedpathak, S. C. Erwin, D. J. Keavney, R. Winarski, P. Ryan, and R. A. Rosenberg, Phys. Rev. B **70**, 033201 (2004).

AY 2003-2004

- “Deposition of Nanosized Grains of Ferroelectric Lead Zirconate Titanate On Thin Films Using Dense Plasma Focus,” Ruby Gupta, M. P. Srivastava, V. R. Balakrishnan, R. H. Kodama and M. C. Peterson, J. Phys. D: Applied Physics **37**, 1091 (2004).

AY 2002-2003

- “Search for Non-collinear Moments at Permalloy/Copper Interfaces,” M. Vedpathak and R. H. Kodama, J. Appl. Phys. **93**, 8247 (2003).
- “Temperature Dependence of Magnetic Resonance in NiO Nanoparticles,” V.V. Pishko, S.L. Gnatchenko, V.V. Tsapenko, R.H. Kodama, and Salah A. Makhlof, J. Appl. Phys. **93**, 7382 (2003)

AY 2001-2002

- “Electron spin resonance study of NiO antiferromagnetic nanoparticles,” M. Rubinstein, R.H. Kodama, and Salah A. Makhlof, J. Magn. Magn. Mater. **234**, 289 (2001).

AY 2000-2001

- “New memory effect in ferro/antiferromagnetic multilayers,” R.H. Kodama, A.S. Edelstein, P. Lubitz, and H. Sieber, J. Appl. Phys. **87**, 5067 (2000).

AY 1999-2000

- “Magnetic nanoparticles,” (invited) R.H. Kodama, J. Magn. Magn. Mater. Special Issue - V.200 Magnetism Beyond 2000, 359 (1999).
- “Synthesis and characterization of magnetic nanocomposite films,” R.H. Kodama and A.S. Edelstein, J. Appl. Phys. **85**, 4316 (1999).

“Interlayer coupling and enhanced coercivity in ferromagnetic/antiferromagnetic structures,” A.S. Edelstein, R.H. Kodama, M. Miller, V. Browning, P. Lubitz, S.F. Cheng and H. Sieber, *Appl. Phys. Lett.* **74**, 3872 (1999).

“Ferromagnetic/antiferromagnetic structures with ferromagnetic interlayer coupling,” A.S. Edelstein, R.H. Kodama, M. Miller, V. Browning, P. Lubitz and H. Sieber, *J. Appl. Phys.* **85**, 5886 (1999).

“Anomalous properties of magnetic nanoparticles,” A.E. Berkowitz, R.H. Kodama, S.A. Makhlof, F.T. Parker, F.E. Spada, E.J. McNiff Jr., and S. Foner, Proceedings of the 7th European Magnetic Materials and Applications Conference, *J. Magn. Magn. Mater.* **196-197**, 591 (1999).

AY 1998-1999

“Atomic-scale magnetic modeling of oxide nanoparticles,” R. H. Kodama and A. E. Berkowitz, *Phys. Rev. B* **59**, 6321 (1999).

“Role of interfacial uncompensated antiferromagnetic spins in unidirectional anisotropy in Ni₈₁Fe₁₉/CoO bilayers” (invited), K. Takano, R.H. Kodama, A.E. Berkowitz, W. Cao and G. Thomas, *J. Appl. Phys.* **83**, 6888 (1998).

“Spin-flop tendencies in exchange-biased Co/CoO thin films,” J.A. Borchers, Y. Ijiri, S.H. Lee, C.F. Majkrzak, G.P. Felcher, K. Takano, R.H. Kodama and A.E. Berkowitz. *J. Appl. Phys.* **83**, 7219 (1998).

AY 1997-1998

“Interfacial uncompensated antiferromagnetic spins: Role in unidirectional anisotropy in polycrystalline Ni₈₁Fe₁₉/CoO bilayers,” K. Takano, R.H. Kodama, A.E. Berkowitz, W. Cao and G. Thomas, *Phys. Rev. Lett.* **79**, 1130 (1997).

“Finite size effects in antiferromagnetic NiO nanoparticles,” R.H. Kodama, S.A. Makhlof and A.E. Berkowitz, *Phys. Rev. Lett.* **79**, 1393 (1997).

“Surface spin disorder in ferrite nanoparticles” (invited), R.H. Kodama, A.E. Berkowitz, E.J. McNiff Jr. and S. Foner, *J. Appl. Phys.* **81**, 5552 (1997).

AY 1996-1997

“Surface spin disorder in ferrite nanoparticles,” R.H. Kodama, A.E. Berkowitz, E.J. McNiff Jr. and S. Foner, *Materials Science Forum*, **235-238**, 643 (1997).

“Surface spin disorder in NiFe₂O₄ nanoparticles,” R.H. Kodama, A.E. Berkowitz, E.J. McNiff Jr. and S. Foner, *Phys. Rev. Lett.* **77**, 394 (1996).

Earlier work

“Low temperature magnetic relaxation in NiFe₂O₄ nanoparticles,” R.H. Kodama, C.L. Seaman, A.E. Berkowitz and M.B. Maple, *J. Appl. Phys.* **75**, 5639 (1994).

“Spark erosion for production of nanocrystalline materials,” R.H. Kodama, A.E. Nash, F.E. Spada, and A.E. Berkowitz, NATO Advanced Study Institute on Nanophase Materials, G.C. Hadjipanayis and R.W. Siegel (eds.), Kluwer Academic Publishers, p. 101, (1994).

“Precision ultrasonic thickness measurements on thin steel parts,” G.V. Blessing, D.G. Eitzen, J.F. Henning, R.H. Kodama, A.V. Clark and R.E. Schramm, *Materials Evaluation* **49**, 982 (1991).