

Daniel Rosenmann

Principal Engineering Specialist

Quantum and Energy Materials Group

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Education

M. S. Physics, Northern Illinois University, DeKalb, Illinois, USA

B. S. Physics, Universidad Nacional Mayor de San Marcos, Lima - Peru

Awards and honors

- Pacesetter Award, Argonne National Laboratory (2009)
For extraordinary effort in making sputter and e-beam deposition techniques safely available to CNM staff members and User Community.
- Pacesetter Award, Argonne National Laboratory (2004)
For exceptional performance at the University of Chicago Review of the Materials Science Division.
- Pacesetter Award, Argonne National Laboratory (1999)
For extraordinary effectiveness in significantly enhancing the safety standards and inspection readiness of the Materials Science Division.
- Sigma-Pi-Sigma, Physics Honor Society, NIU Chapter (1993)

Research interests

- Design and development of novel “smart probes”, which act as detectors for synchrotron x-ray scanning tunneling microscopy (SX-STM), an emerging scanning probe technique for imaging of nanoscale materials, which combines the sub-nanometer spatial resolution of SPM with the chemical, electronic and magnetic sensitivity of synchrotron radiation.
- Synthesis and characterization of heterostructures and metamaterials for photonic applications.
- Synthesis via sputtering or e-beam evaporation of metallic, magnetic and dielectric thin films and heterostructures for plasmonic and superconductivity applications.

Professional Experience

Argonne National Laboratory - Center for Nanoscale Materials (CNM)

2010 - present

Principal Engineering Specialist

- Design and development of novel “smart probes”, which act as detectors for synchrotron x-ray scanning tunneling microscopy (SX-STM), an emerging scanning probe technique for imaging of nanoscale materials, which combines the sub-nanometer spatial resolution of SPM with the chemical, electronic and magnetic sensitivity of synchrotron radiation.
- Synthesis of superconducting, metallic, and dielectric films as well as metamaterials structures for plasmonic and nanophotonics applications.

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Argonne National Laboratory - Center for Nanoscale Materials (CNM)

2008 - 2010

Engineering Specialist Senior

- Major modifications and upgrades to a million-dollar Lesker tool (DC magnetron/ RF sputtering and e-beam evaporator system), such as the design and implementation of a Multi-Leaf Shutter assembly and solving software and component integration issues that prevented this tool from being operational. I received a Pacesetter Award in FY 2009 for this effort.
- User interactions include the training of CNM Users and staff on the use and safe operation of these tools. Safety management responsibilities include the preparation of Standard Operating Procedures and all ancillary efforts to safe operation of the scientific instruments.

Argonne National Laboratory – Materials Science Division (MSD)

2001 - 2008

Scientific Associate Senior

- Synthesis of high quality single crystals of the high temperature superconductor $\text{YBa}_2\text{Cu}_3\text{O}_{7-d}$ with flux method using a Lindberg/Blue box furnace.
- Initiated and developed techniques for synthesizing ultra-high purity and impurity doped NbSe_2 single crystals with the vapor transport method using a three-zone furnace.
- Took the lead in synthesizing single crystals of the newly discovered graphite intercalation superconductors CaC_6 , YbC_6 , and SrC_6 and quickly established Argonne as the lead of these unique crystals. Characterization of magnetic and structural properties of these and other samples with SQUID magnetometry (Quantum Design System) and X-ray diffraction (Rigaku Geigerflex and Phillips closed x-ray Xpert/PRO diffractometers), respectively.
- Engineered the design and installation from ground up of a custom-built UHV sputtering system for the deposition of metallic films and multilayers. Work included the design and fabrication of a power supply unit for thermally baking the chamber and the ion pump, the fabrication of a home-built control panel to remotely activate pneumatic valves and pumps and the design and implementation of a novel semi-automatic manipulator to transfer samples from the load-lock to the sputtering chamber. This system was instrumental in the research on high-speed hydrogen sensors that won an R&D100 Award in 2006.

Argonne National Laboratory – Materials Science Division (MSD)

1996 - 2001

Scientific Associate

- Design and operation of a multiple furnace-based sample preparation laboratory in support of a leading research program in superconductivity. Activities included establishing thermal annealing parameters for crystal growth of high temperature superconductors and vapor depositing electrical contacts or protective coatings onto these materials using a E6700 Polaron Turbo Vacuum Evaporator.
- Design of a custom turbomolecular-based high vacuum pumping system to resolve vacuum contamination problems. Troubleshooting and repair of vacuum leaks in cryogenic systems using leak detectors.

Northern Illinois University – Physics Department

1994 - 1996

Research Laboratory Manager, Mossbauer Effect Laboratory

- Responsible for operation and assembly of Mossbauer spectrometers and implementing computer data acquisition systems. Computer analysis and graphical representation of the experimental and modeled data.
- Research on optically-induced electronic transitions in perovskite materials using Mossbauer spectroscopy with focus on charge fluctuations and their effect on magnetism and phase stability.

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Selected Publications

Selected publications:

Synchrotron x-ray imaging, scanning tunneling microscopy (SX-STM)

1. *Local X-ray Magnetic Circular Dichroism Study of Fe/Cu(111) Using a Tunneling Smart tip*, Andrew DiLullo, Nozomi Shirato, Marvin Cummings, Heath Kersell, Hao Chang, **Daniel Rosenmann**, Dean Miller, John Freeland, Saw-Wai Hla, and Volker Rose, *J. Synchrotron Rad.* **23**, 574-578 (2016)
2. *Elemental Fingerprinting of Materials with Sensitivity at the Atomic Limit*, Nozomi Shirato, Marvin Cummings, Heath Kersell, Yang Li, Benjamin Stripe, **Daniel Rosenmann**, Saw-Wai Hla, Volker Rose, *Nano Lett.*, **14 (11)**, 6499-6504 (2014)
3. *An Easy-to-Implement Filter for Separating Photo-Excited Signals from Topography in Scanning Tunneling Microscopy*, Kangkang Wang, **Daniel Rosenmann**, Martin Holt, Robert Winarski, Saw-Wai Hla, Volker Rose, *Rev. Sci. Instrum.* **84**, 063704 (2013)
4. *Synchrotron X-ray Scanning Tunneling Microscopy: Fingerprinting Near to Far Field Transitions on Cu(111) Induced by Synchrotron Radiation*, Volker Rose, Kangkang Wang, TeYu Chien, Jon Hiller, **Daniel Rosenmann**, John W. Freeland, Curt Preissner, Saw-Wai Hla, *Adv. Funct. Mater.* **23**, 2646 - 2652 (2013)
5. *Spin-Dependent Synchrotron X-ray Excitations Studied by Scanning Tunneling Microscopy*, V. Rose, T.Y. Chien, J.W. Freeland, **D. Rosenmann**, J. Hiller, V. Metlushko, *J. Appl. Phys.* **111**, 07E304 (2012)
6. *X-ray Nanotomography of SiO₂-Coated Pt₉₀Ir₁₀ Tips with Sub-Micron Conducting Apex*, V. Rose, T.Y. Chien, J. Hiller, **D. Rosenmann**, and R.P. Winarski, *Appl. Phys. Lett.* **99**, 173102 (2012)
7. *Elemental and Magnetic Sensitive Imaging Using X-ray Excited Luminescence Microscopy*, R.A. Rosenberg, S. Zohar, D. Keavney, R. Divan, **D. Rosenmann**, K.A. Mascarenhas and M.A. Steiner, *Rev. Sci. Instrum.* **83**, 073701 (2012)

Metamaterials and plasmonic materials for optical applications

8. *Enhanced Structural Color Generation in Aluminum Metamaterials Coated with a Thin Polymer Layer*, Fei Cheng, Xiaodong Yang, **Daniel Rosenmann**, David Czaplewski, Liliana Stan, and Jie Gao, *Opt. Express* **23** (19), 25329-25339 (2015)
9. *Anomalous Ultrafast Dynamics of Hot Plasmonic Electrons in Nanostructures with Hot Spots*, Hayk Harutyunyan, Alex B. F. Martinson, **Daniel Rosenmann**, Larousse K. Khorashad, Lucas V. Besteiro, Alexander O. Govorov, and Gary P. Wiederrecht, *Nature Nanotech.*, **10**, 770-774 (2015)
10. *Dynamic Near-Field Optical Interaction Between Oscillating Nanomechanical Structures*, Phillip Ahn, Xiang Chen, Zheng Zhang, Matthew ford, **Daniel Rosenmann**, Ill Woong Jung, Cheng Sun, and Oluwaseyi Balogun, *Sci. Rep.* **5**, 10058 (2015)
11. *Broadband Perfect Absorber Based on one Ultrathin Layer of Refractory Metal*, Huixu Deng, Zhigang Li, Liliana Stan, **Daniel Rosenmann**, David Czaplewski, Jie Gao, and Xiaodong Yang, *Opt. Lett.* **40**(11), 2592-2595 (2015)
12. *Aluminum Plasmonic Metamaterials for Structural Color Printing*, Fei Cheng, Jie Gao, Liliana Stan, **Daniel Rosenmann**, David Czaplewski, and Xiaodong Yang, *Opt. Express* **23**(11), 14552-14560 (2015)
13. *When are Surface Plasmon Polaritons Excited in the Kretschmann-Raether Configuration?*, Jonathan J. Foley, IV, Hayk Harutyunyan, **Daniel Rosenmann**, Ralu Divan, Gary P. Wiederrecht, and Stephen K. Gray, *Sci. Rep.* **5**, 9929 (2015)
14. *Ultra-confined Modes in Metal Nanoparticle Arrays for Subwavelength Light Guiding and Amplification*, Edgar Palacios, Aiqing Chen, Jonathan Foley, Stephen Gray, Ulrich Welp, **Daniel Rosenmann**, and Vitalii Vlasko-Vlasov, *Adv. Optical Mater.* **2**, 394-399 (2014)
15. *Experimental Demonstration of Near-infrared Epsilon-Near-Zero Multilayer Metamaterials Slabs*, Xiaodong Yang, Changyu Hu, Huixu Deng, **Daniel Rosenmann**, David Czaplewski, and Jie Gao, *Optics Express* Vol. **21**, Iss. 20, pp. 23631-23639 (2013)

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Synthesis of metallic, magnetic, and dielectric films and heterostructures for diverse applications

16. *Automated Geometry Assisted Proximity Effect Correction for Electron Beam Direct Write Nanolithography*, Leonidas E. Ocola, David Gosztola, **Daniel Rosenmann**, Gerald Lopez, J. Vac. Sci. Technol. B **33**, 06FD02 (2015)
17. *ZnO Functionalization of Multi-walled Carbon Nanotubes for Methane Sensing at Single parts per Million Concentrations Levels*, Md Humayun, R. Divan, L. Stan, A. Gupta, **D. Rosenmann**, L. Gundel, P. Solomon, I. Paprotny, J. Vac. Sci. Technol. B **33**, 06FF01 (2015)
18. *Antiferromagnetic Domain Wall Engineering in Chromium Films*, J.M. Logan, H.C. Kim, **D. Rosenmann**, Z. Cai, R. Divan, O.G. Shpyrko and E.D. Isaacs, Appl. Phys. Lett. **100**, 192405 (2012)
19. *Toward Practical Gas Sensing Using Highly Reduced Graphene Oxide: A New Signal Processing Method to Circumvent Run-to-Run and Device-to-Device Variations*, Lu, Ganhua; Park, Sungjin; Yu, Kehan; Ruoff, Rodeney; Ocola, L; **Rosenmann, D**; Chen, Jumhong, ACS Nano, **5** (2), 1154-1164 (2011)
20. *Self-Assembled Monolayer-Enhanced Hydrogen Sensing with Ultrathin Palladium Films*, T. Xu, M.P. Zach, Z. L. Xiao, **D. Rosenmann**, U. Welp, W. K. Kwok, and G. W. Crabtree, Appl. Phys. Lett. **86**, 203104 (2005)

Superconductivity

21. *Self-healing Patterns in Ferromagnetic-Superconducting Hybrids*, Vlasko-Vlasov, Vitalii; Palacios, Edgar; **Rosenmann, Daniel**; Pearson, J; Jia, Ying; Wang, Yong-Lei; Welp, Ulrich; Kwok, Wai-Kwong, Supercond. Sci. Technol. **28**, 035006 (2015)
22. *Tungsten Silicide Films for Kinetic Inductance Detectors*, T. Cecil, A. Miceli, O. Quaranta, C. Liu, **D. Rosenmann**, S. McHugh, and B.A. Mazin, Appl. Phys. Lett. **101**, 032601 (2012)
23. *Domain Structure and Magnetic Pinning in Ferromagnetic/Superconducting Hybrids*, V. Vlasko-Vlasov, A. Buzdin, A. Melnikov, U. Welp, **D. Rosenmann**, L. Uspenskaya, V. Fratello and W. Kwok, Phys. Rev. B **85**, 064505 (2012)
24. *The Local Effect of Magnetic Impurities on Superconductivity Co_xNbSe_2 and Mn_xNbSe_2 Single Crystals*, Iavarone M., Karapetrov G., Fedor J., **Rosenmann D.**, Nishizaki T., Kobayashi N., J. Physics.: Condens. Matter **22**, No 1, 015501 (2010)
25. *Muon Spin Rotation of the Magnetic Penetration Depth in the Intercalated Graphite Superconductor CaC_6* , D. Di Castro, A. Kanigel, A. Maisuradze, A. Keren, P. Postorino, **D. Rosenmann**, U. Welp, G. Karapetrov, H. Claus, D. G. Hinks, A. Amato, and J. C. Campuzano, Phys. Rev. B **82**, 014530 (2010)
26. *Soft Magnetic Lithography and Giant Magnetoresistance in Superconducting / Ferromagnetic Hybrids*, V. K. Vlasko-Vlasov, U. Welp, A. Imre, **D. Rosenmann**, J. Pearson, and W. -K. Kwok, Phys. Rev. B **78**, 214511 (2008)
27. *Effect of Magnetic Impurities on the Vortex Lattice Properties in $NbSe_2$ Single Crystals*, M. Iavarone, R. Di Capua, G. Karapetrov, A. E. Koshelev, **D. Rosenmann**, H. Claus, C. D. Malliakas, M. G. Kanatzidis, T. Nishizaki, N. Kobayashi, Phys. Rev. B **78**, 174518 (2008)
28. *Guiding Superconducting Vortices by Magnetic Domain Walls*, V. Vlasko-Vlasov, U. Welp, G. Karapetrov, V. Novosad, **D. Rosenmann**, M. Iavarone, A. Belkin, W.-K. Kwok, Phys. Rev. B **77**, 134518 (2008)
29. *Large Ca Isotope Effect in the CaC_6 Superconductor*, D.G. Hinks, **D. Rosenmann**, H. Claus, M. S. Bailey, J. D. Jorgensen, Phys. Rev. B **75**, 014509 (2007)
30. *Direct Observation of Geometrical Phase Transitions in Mesoscopic Superconductors by Scanning Tunneling Microscopy*, G. Karapetrov, J. Fedor, M. Iavarone, **D. Rosenmann**, and W. K. Kwok, Phys Rev Lett **95**, 167002 (2005)

Patents

- *Method for Simultaneous Topographic and Elemental, Chemical, and Magnetic Contrast in Scanning Tunneling Microscopy (SX-STM)*. Volker Rose; KangKang Wang, Curt Preissner, Saw-Wai Hla, and **Daniel Rosenmann** (2014), No. 8,850,611