

**SAMIR M. AOUADI**

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**PROFESSIONAL EXPERIENCE:**

**Assistant Professor, Department of Physics** (8/02 - Pres)  
Southern Illinois University, Carbondale, IL

**Visiting Assistant Professor, Department of Mechanical Engineering** (7/00 - 7/02)  
University of Nebraska, Lincoln, NE

**Assistant Professor, Department of Physics** (8/98 – 7/00)  
American University of Sharjah, Sharjah, U.A.E.

**Research Scientist/Group Leader** (5/95 – 7/98)  
Cametoid Ltd, Whitby, Ontario, Canada

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**EDUCATION:**

**Doctor of Philosophy, Physics**, University of British Columbia, Vancouver, B.C. (1995).

**Master of Science, Physics**, University of Ottawa, Ottawa, Ontario (1989).

**Bachelor of Science, Physics**, University of Strasbourg, France, and University of Constantine, Algeria (1986).

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**RESEARCH ACTIVITIES**

**RESEARCH INTERESTS**

Nanostructured thin film deposition and surface engineering. Development of advanced protective, electronic, optical, and biomedical films. Emphasis on self-lubricating protective coatings for high temperature applications. Real time process monitoring and control using spectroscopic ellipsometry. Characterization and testing of the physical and chemical properties of thin films using scanning electron microscopy, transmission electron microscopy, atomic force microscopy, x-ray diffraction, x-ray photoelectron spectroscopy, Auger electron spectroscopy, time of flight Secondary ion mass spectroscopy, Rutherford backscattering, Raman spectroscopy, optical emission spectroscopy, spectroscopic ellipsometry, nanoindentation, wear testing, and biocompatibility testing. Ab-initio density functional theory and molecular dynamics calculations of band structure, density of states, optical properties, and mechanical properties.

## FUNDED RESEARCH PROPOSALS

### External:

***Combating Restenosis with Nano-Texturing, PI (Recently funded – Start Summer of 2008)***  
National Institute of Health - Funding Period: 07/08 through 07/10 - Total Award: \$216,507.

***Research Experience for Undergraduates Supplement: Combinatorial Process Development for the Synthesis of Novel Nano-Textured and Ultra-Hard Films, PI.***  
National Science Foundation – Funding Period: 07/07 through 07/08. Total Award: \$12,000.

***Combinatorial Process Development for the Synthesis of Novel Nano-Textured and Ultra-Hard Films, PI.***  
National Science Foundation – Funding Period: 07/07 through 07/10. Total Award: \$310,000.

***Air Force Summer Faculty Fellowship Program***  
Wright Patterson Air Force Base, OH - Funding Period: Summer 2007 - Total Award: \$15,000.

***Investigation of Glassy Alloys Deposited by Unbalanced Magnetron Sputtering, PI***  
Metaglass Coatings, LLC - Funding Period: 01/06 through 06/07 - Total Award: \$15,000.

***Summer Institute on Nanomechanics and Materials at Northwestern University***  
National Science Foundation Fellowship - July 2006 - Total Award: \$3,000.

***Summer Institute on Nanomechanics and Materials at Northwestern University***  
National Science Foundation Fellowship - June 2004 - Total Award: \$3,000.

***Real-Time Spectroscopic Ellipsometry Study of the Growth of Nitride/Metal Nanocomposite and Nanolaminate Coatings, PI***  
Research Corporation - Funding Period: 09/04 through 08/06 - Total Award: \$42,000.

***Ellipsometric Measurements, PI***  
Spire Biomedical, Bedford, MA - Funding Period: 04/06 through 06/02 - Total award: \$4,000.

### Internal:

***Wear and Biocompatibility of Nanocomposite Coatings for Metal-on-Metal Hip Replacement, PI***  
ORDA Multidisciplinary Grant - Funding Period: 01/06 through 12/06 - Total Award: \$30,000.

***Design of Novel Ceramic-Based Nanocomposite Protective Coatings, PI***  
Materials Technology Center - Funding Period: 07/05 through 06/06 - Total Award: \$9,000.

***Nanocomposite Coatings for Biomedical Implants, PI***  
Materials Technology Center - Funding Period: 07/04 through 06/05 - Total Award: \$7,000.

***Nanocomposite and Nanolaminate Coatings for Biomedical Implants, PI***  
ORDA Seed Grant - Funding period: 01/03 through 12/03 - Total award: \$12,600.

**Equipment Donations:**

Boeing, St-Louis, MO. Principal Investigator. Sputtering chamber, target materials, leak detector, furnace. Awarded: 07/03.

Spire Biomedical, Bedford, MA. Wear tester. Awarded: 11/02.

**Other Funded Activities:**

***Undergraduate Research Assistanship (2007-2008)***

SIUC-Internal - Funds an undergraduate student for 2 semesters (20 hours/week)

***Research Education for Undergraduates (REU) – Chemistry, Listed as Senior Personnel***

National Science Foundation – Active Since Summer of 2006

**PENDING RESEARCH PROPOSALS**

***Computational and Experimental Investigation to Understand the Adaptation Mechanisms of “Chameleon” Coatings***

National Science Foundation – Submitted February 2008 – Amount requested: \$340,959.

***Acquisition of a Nanohardness Tester and an Atomic Force Microscope for Advanced Materials Research, PI***

National Science Foundation - Submitted January 2008 - Amount requested: \$280,754.

***Acquisition of a Physical Properties Acquisition System for Applied Materials Research and Education, Co-PI***

National Science Foundation - Submitted January 2008 - Amount requested: \$354,335.

***Collaborative Research: Understanding the Role of Surface Nano-Texturing in Combating In-stent Restenosis and Late-stent Thrombosis, PI***

National Science Foundation - Submitted November 2007 - Amount Requested: \$323,374.

***Acquisition of a Nanohardness Tester and an Atomic Force Microscope for Advanced Materials Research, PI***

Department of Defense - Submitted August 2007 - Amount Requested: \$280,754.

**PUBLICATIONS**

**In Preparation**

1. **S.M. Aouadi**, B. Sirota, P. Basnyat, S. Stadler, S.R. Mishra, Q. Ge, “Understanding the Adaptation Mechanisms of Mo<sub>2</sub>N/MoS<sub>2</sub>/Ag Self-Lubricating Coatings”, In Preparation.
2. Y. Zhang, B. Luster, P. Kohli, **S.M. Aouadi**, S. Talapatra, “Tribological Investigation of Vertically Aligned Carbon Nanotubes/MoS<sub>2</sub> Composite Coatings”, In Preparation.

3. Y. Paudel, P. Basnyat, S. Stadler, J. Xu, S.R. Mishra, **S.M. Aouadi**, "A Comparative Study of the Mechanical and Tribological Properties of Mo<sub>2</sub>N-Based Self-Lubricating Films", In Preparation.
4. Y. Paudel, B. Ussher, S. Stadler, C. Muratore, A.A. Voevodin, **S.M. Aouadi**, "Tribological Investigation of Adaptive Mo<sub>2</sub>N/MoS<sub>2</sub>/Ag Coatings with High Sulfur Content", In Preparation.

**Submitted**

5. P. Basnyat, B. Luster, C. Muratore, A.A. Voevodin, R. Haasch, R. Zakeri, P. Kohli, **S.M. Aouadi**, "Surface Texturing for Adaptive Solid Lubrication", Submitted to Surf. Coat. Technol. (Feb. 2008).
6. D.M. Mihut, J. Li, S.R. Kirkpatrick, **S.M. Aouadi**, S. Varma, S.L. Rohde, "Assessing Nanomechanical, Nanotribological Properties and Surface Energies of Metal-ZrN and ZrN Thin Films", Submitted to J. Vac. Sci. Technol. (2007).
7. D.M. Mihut, **S.M. Aouadi**, S.L. Rohde, J. Turner, "Atomic Force Microscope Investigation on Static Nanomechanical Properties versus Dynamic Nanotribological Evaluation of Metal-ZrN and ZrN Thin Films", Submitted to Tribol. Lett. (2007).

**2008:**

8. Z. Kertzman, A. Aul, J. Marchal, P. Filip, P. Kohli, **S.M. Aouadi**, "Mechanical, Tribological, and Biocompatibility Properties of ZrN-Ag Nanocomposite Films", J. Biomed. Mat. Res. 84, 1061 (2008).
9. **S.M. Aouadi**, Y. Paudel, B. Luster, S. Stadler, P. Kohli, C. Muratore, C. Hager, A.A. Voevodin, "Adaptive Mo<sub>2</sub>N/MoS<sub>2</sub>/Ag Tribological Nanocomposite Coatings for Aerospace Applications", Trib. Lett. 29, 95 (2008).

**2007:**

10. P. Basnyat, B. Luster, Z. Kertzman, S. Stadler, P. Kohli, **S.M. Aouadi**, J. Xu, S.R. Mishra, O. Eryilmaz, A. Erdemir, "Mechanical and Tribological Properties of CrAlN-Ag Self-Lubricating Nanocomposite Films", Surf. Coat. Technol. 202, 1011(2007).

**2006:**

11. **S.M. Aouadi**, A. Bohnhoff, T. Amriou, M. Williams, J.N. Hilfiker, "VUV Spectroscopic Ellipsometry of Nanocrystalline Single and Multi-Phase Protective Thin Films" J. Phys.: Condens. Matter 18, S1691 (2006).
12. **S.M. Aouadi**, A. Bohnhoff, M. Sodergren, D.M. Mihut, S.L. Rohde, J. Xu, S.R. Mishra, "Tribological Investigation of Zirconium Nitride/Silver Nanocomposite Structures", Surf. Coat. Technol. 201, 418 (2006).
13. **S.M. Aouadi**, "Structural and Mechanical Properties of TaZrN Films: Experimental and Ab-Initio Studies" J. Appl. Phys. 99, 053507 (2006).
14. **S.M. Aouadi**, T. Maeruf, D.M. Mihut, S.L. Rohde, "Characterization of CrZrN Thin Films" Surf. Coat. Technol. 200, 3411 (2006).
15. **S.M. Aouadi**, Y. Zhang, P. Basnyat, S. Stadler, P. Filip, M. Williams, N. Singh, J.N. Hilfiker, J.A. Woollam, "Physical and Chemical Properties of Sputter-Deposited Ta-C-N Films", J. Phys.: Condens. Matter 18, 1977 (2006).
16. **S.M. Aouadi**, P. Basnyat, Y. Zhang, Q. Ge, P. Filip, "Grain Boundary Sliding Mechanisms in ZrN-Ag, ZrN-Au, and ZrN-Pd Nanocomposite Films" Appl. Phys. Lett. 88, 021902 (2006).

**2005:**

17. **S.M. Aouadi**, P.K. Shreeman, Q. Ge, J. Xu, S.R. Mishra, "Correlation Between Interfacial Electronic Structure and Mechanical Properties of ZrN-M (M=Ag, Au, or Pd) Nanocomposite Films" Appl. Phys. Lett. 87, 041902 (2005).
18. **S.M. Aouadi**, Y. Zhang, M. Williams, J. Lee, "Real Time Spectroscopic Ellipsometry Study of Ta-Si-N Ultra-Thin Diffusion Barriers" J. Vac. Sci. Technol. A 23, 1359 (2005).
19. **S.M. Aouadi**, T. Maeruf, M. Debessai, P. Filip, "Characterization of Zirconium Nitride/Nickel Nanocomposite Protective Films", Vacuum 79, 186 (2005).
20. **S.M. Aouadi**, T. Maeruf, M. Sodergren, D.M. Mihut, S.L. Rohde, J. Xu, S.R. Mishra, "Growth and Characterization of ZrN-Inconel Structures" J. Vac. Sci. Technol. A 23, 998 (2005).
21. **S.M. Aouadi**, A. Bohnhoff, T. Amriou, R.T. Haasch, M. Williams, J.N. Hilfiker, "Optical and Electronic Properties of TaZrN Films: Experimental and Ab-Initio Studies" J. Vac. Sci. Technol. A 23, 705 (2005).
22. T. Amriou, B. Khelifa, H. Aourag, **S. M. Aouadi**, C. Mathieu, "Ab-initio Investigation of the Jahn-Teller Distortion Effect on the Stabilizing Lithium Intercalated Compounds", Mat. Chem. Phys. 92, 499 (2005).

#### 2004:

23. **S.M. Aouadi**, P.K. Shreeman, M. Williams, "Real-Time Spectroscopic Ellipsometry Study of Ultra-Thin Diffusion Barriers for Integrated Circuits", J. Appl. Phys. 96, 3949 (2004).
24. **S.M. Aouadi**, M. Debessai "Optical Properties of Tantalum Nitride Coatings", J. Vac. Sci. Technol. 22, 1975 (2004).
25. **S.M. Aouadi**, P. Filip, M. Debessai, "Characterization of Tantalum Zirconium Nitride Sputter-Deposited Nanocrystalline Coatings", Surf. Coat. Technol. 187, 177 (2004).
26. M. Debessai, P. Filip, **S.M. Aouadi**, "Characterization of Niobium Zirconium Nitride Protective Coatings", Appl. Surf. Sci. 236, 63 (2004).
27. **S.M. Aouadi**, M. Debessai, R. Tomek, T. Maeruf, "Spectroscopic Ellipsometry Study of the Growth of Nanocrystalline Protective Coatings" J. Vac. Sci. Technol. B22, 1822 (2004).
28. **S.M. Aouadi**, M. Debessai, P. Filip, "Zirconium Nitride/Silver Nanocomposite Structures", J. Vac. Sci. Technol. B22, 1134 (2004).
29. **S.M. Aouadi**, K.C. Wong, K.A.R. Mitchell, F. Namavar, E. Tobin, D. Mihut, S.L. Rohde, "Characterization of TiCrN Nanocomposite Protective Coatings", Appl. Surf. Sci. 229, 387 (2004).
30. **S.M. Aouadi**, M. Debessai, F. Namavar, K.C. Wong, K.A.R. Mitchell, "Titanium Boron Nitride Films Grown by Ion Beam Assisted Deposition: Chemical and Optical Characterization", Surf. Coat. Technol. 183, 369 (2004).

#### 2003:

31. T.Z. Gorishnyy, **S.M. Aouadi**, D.M. Mihut, and S.L. Rohde, "Physical and Mechanical Properties of Reactively Sputtered CrBN Thin Films", Thin Solid Films 445, 96 (2003).
32. T.Z. Gorishnyy, **S.M. Aouadi**, L.G. Olson, and S.L. Rohde, "Optimization of Wear-Resistant Coating Architecture Using Finite Element Analysis" J. Vac. Sci. Technol. A21, 332 (2003).

#### 2002:

33. **S.M. Aouadi**, J. Chladek, F. Namavar, and S.L. Rohde, "Characterization of Ti-Based Nanocrystalline Ternary Nitride Films" J. Vac. Sci. Technol. 20, 1967 (2002).
34. **S.M. Aouadi**, T.Z. Gorishnyy, S.L. Rohde, "In-Situ Ellipsometry Study on Nitride Coatings", **Invited Paper, Vacuum Technology & Coating Magazine, (September 2002), p. 34.**

35. **S.M. Aouadi**, T.Z. Gorishnyy, J. Chladek, S. Varma, J.A. Turner, S.L. Rohde, "Mechanical, Structural, and Optical Properties of CrBN Coatings", 45<sup>th</sup> SVC Technical Conference Proceedings, Lake Buena Vista, FL (April 13-18, 2002) p. 25.
36. **S.M. Aouadi**, T. Gorishnyy, F. Namavar, and S.L. Rohde, "Characterization of TiBN Films Grown by Ion Beam Assisted Deposition", Surf. Coat. Technol. 160, 145 (2002).
37. **S.M. Aouadi**, E. Tobin, F. Namavar, T.Z. Gorishnyy, and S.L. Rohde, "Growth and Analysis of Binary and Ternary Nitride Coatings Using Spectroscopic Ellipsometry", **Invited Paper, Cover Page, Vacuum Technology & Coating Magazine, p. 49 (March 2002).**
38. **S.M. Aouadi**, F. Namavar, R. Haash, N. Finnegan, R. Nilchiani, J.A. Turner, and S.L. Rohde, "Characterization of CrBN Films Grown by Ion Beam Assisted Deposition", J. Appl. Phys. 91, 1040 (2002).
39. **S.M. Aouadi**, T.Z. Gorishnyy, D.M. Hornyak, and S.L. Rohde, "Control and Monitoring of Growth of Chromium Nitride Coatings Using In-Situ Spectroscopic Ellipsometry", Surf. Coat. Technol. 153, 1 (2002).

**Prior to 2002:**

40. **S.M. Aouadi**, D.M. Mihut, M.L. Kuruppu, S.R. Kirkpatrick, and S.L. Rohde "Spectroscopic Ellipsometry Measurements of Chromium Nitride Films", J. Vac. Sci. Technol. A 19, 2800 (2001).
41. **S.M. Aouadi**, D.M. Schultze, K.C. Wong, K.A.R. Mitchell, and S.L. Rohde, "Growth and Characterization of CrN/Cr<sub>2</sub>N Multilayer Coatings", Surf. Coat. Technol. 140, 269 (2001).
42. **S.M. Aouadi**, E. Tobin, F. Namavar, T.Z. Gorishnyy, and S.L. Rohde, "Growth and Analysis of Binary and Ternary Nitride Coatings Using Spectroscopic Ellipsometry", 44<sup>th</sup> SVC Annual Technical Conference Proceedings, Philadelphia, PA (April 2001) p. 9.
43. **M.S. Aouadi** and K.L. Yan, "Development of Novel High-Performance Protective Coatings for Applications in Severe Environments", Proceedings of the 3<sup>rd</sup> CF/CRAD Meeting on Naval Applications on Materials Technology and Inter Naval Corrosion Conference, Halifax, Nova Scotia, April 22-24 (1997).
44. **M.S. Aouadi**, A. Kleinschmidt, G.A. Clarke, N. R. Osborne, R.R. Parsons, L.B. Da Silva, "Inconel/Carbon Multilayers for X-ray Mirrors", Thin Solid Films 303, 53 (1997).
45. **M.S. Aouadi**, P.C. Wong, and K.A.R. Mitchell " XPS Study on Carbon/Inconel Bilayers as a Function of Substrate Bias Voltage" Appl. Surf. Sci. 99, 319 (1996).
46. **M.S. Aouadi**, R.R. Parsons, P.C. Wong, K.A.R. Mitchell, " Characterization of Sputter Deposited Inconel/Carbon X-Ray Multilayers ", J. Vac. Sci. Technol. A 11, 115 (1993).
47. **M.S. Aouadi**, R.R. Parsons, P.C. Wong, K.A.R. Mitchell, " Characterization of Sputter Deposited Tungsten Films X-ray Multilayers ", J. Vac. Sci. Technol. A 10, 273 (1992).
48. S.R. Das, J.G. Cook, N.L. Rowell, and **M.S. Aouadi**, " Photoluminescence Spectroscopy of CdTe Epilayers Grown by rf Magnetron Sputtering ", J. Appl. Phys. 68, 5796 (1990).
49. J.G. Cook, **M.S. Aouadi**, and S.R. Das " Emission Spectroscopy as a Non-Invasive Probe for Process Control During rf Sputter Deposition of PbTe ", Can. J. Phys. 67, 287 (1989).

**PRESENTATIONS**

**2008:**

1. **S.M. Aouadi**, Y. Paudel, B. Luster, S. Stadler, C. Muratore, C. Hager, A.A. Voevodin, "Adaptive Mo<sub>2</sub>N/MoS<sub>2</sub>/Ag Tribological Nanocomposite Coatings for Aerospace Applications", STLE Annual Meeting, Cleveland, OH (May 18-22, 2008).

2. P. Basnyat, **S.M. Aouadi**, B. Luster, C. Muratore, A.A. Voevodin, P. Kohli, "Surface Texturing for Adaptive Solid Lubrication", STLE Annual Meeting, Cleveland, OH (May 18-22, 2008).
3. Y. Paudel, P. Basnyat, S. Stadler J. Xu, S.R. Mishra, **S.M. Aouadi**, "A Comparative Study of the Tribological Properties of Mo<sub>2</sub>N-Based Self-Lubricating Films", STLE Annual Meeting, Cleveland, OH (May 18-22, 2008).
4. P. Basnyat, B. Luster, **S.M. Aouadi**, C. Muratore, A.A. Voevodin, P. Kohli, "Surface Texturing by Using Reactive Ion Etching for Adaptive Solid Lubrication", International Conference on Metallurgical Coatings and Thin Films, San Diego, CA (April 28 – May 2, 2008).

**2007:**

5. **S.M. Aouadi**, C. Bradley, B. Luster, P. Basnyat, R. Zakeri, P. Kohli, "Development of Nano-Textured Self-Lubricating Adaptive Coatings", International Conference on Metallurgical Coatings and Thin Films, San Diego, CA (April 23 - 27, 2007).
6. P. Basnyat, B. Luster, Z. Kertzman, S. Stadler, J. Xu, S.R. Mishra, **S.M. Aouadi**, "Mechanical and Tribological Properties of CrAlN-Ag Nanocomposite Films", International Conference on Metallurgical Coatings and Thin Films, San Diego, CA (April 23 - 27, 2007).
7. D.M. Mihut, **S.M. Aouadi**, J.L. Turner, S.L. Rohde "Atomic Force Microscope Investigation on Static Versus Dynamic Evaluation of Metal-ZrN and ZrN Thin Films", International Conference on Metallurgical Coatings and Thin Films, San Diego, CA (April 23 - 27, 2007).

**2006:**

8. D.M. Mihut, J. Li, S.R. Kirkpatrick, **S.M. Aouadi**, S.L. Rohde, "Assessing nanomechanical properties and nanoscratch resistance of Me-ZrN and ZrN thin films using Atomic Force Microscope", 53<sup>rd</sup> International Symposium of the American Vacuum Society, San Francisco, CA (Nov. 12-17, 2006).
9. S. Pradhan, T. Chu, **S.M. Aouadi**, "Tensile Testing of Thin Film Specimens on Polyamide Substrates using SPDIC", 2006 Society of Experimental Mechanics Annual Conference and Exposition, St. Louis, MO (Jun. 4-7, 2006).
10. P. Basnyat, A. Aul, **S.M. Aouadi**, P. Kohli, J. Xu, S.R. Mishra, O. Eryilmaz, J.A. Johnson, A. Erdemir, "Mechanical, Tribological, and Heamocompatibility Properties of ZrN-Ag, ZrN-Au, and ZrN-Pd Nanocomposite Films" International Conference on Metallurgical Coatings and Thin Films, San Diego, CA (May 1 - 5, 2006).
11. **S.M. Aouadi**, P. Basnyat, Y. Zhang, Q. Ge, P. Filip, "Grain Boundary Sliding Mechanisms in ZrN-Ag, ZrN-Au, and ZrN-Pd Nanocomposite Films" International Conference on Metallurgical Coatings and Thin Films, San Diego, CA (May 1 - 5, 2006).
12. L. Jimenez, L.E. Gil, M.H. Staia, **S.M. Aouadi**, "Corrosion Behavior of the Aluminum 7075-T6 Alloy Coated with an Electroless Ni-P / PVD ZrN Duplex Coatings" International Conference on Metallurgical Coatings and Thin Films, San Diego, CA (May 1 - 5, 2006).

**2005:**

13. **S.M. Aouadi**, S. El-Hanafi, A. Bohnhoff, P.K. Shreeman, Q. Ge, J. Xu, S.R. Mishra, P. Filip, "Role of the Interface in the Mechanical Properties of ZrN/M (M=Ag, Au, or Pd) Nanocomposite Films" International Conference on Metallurgical Coatings and Thin Films, San Diego, CA (May 2 - 6, 2005).

**2004:**

14. **S.M. Aouadi**, M. Debessai, J. Xu, S.R. Mishra, D.M. Mihut, S.L. Rohde, "Growth and Characterization of Zirconium Nitride/Inconel Nanocomposite Structures", 51<sup>st</sup> International Symposium of the American Vacuum Society, Anaheim, CA, (Nov. 14-19, 2004).
15. **S.M. Aouadi**, M. Sodergren, E. Hippo, , P. Filip, "Nanocrystalline Films to Improve the Tribological Performance of Biomedical Grade Titanium Alloys", 41th Annual Technical Meeting of the Society of Engineering Science, Lincoln, NE (Oct. 10-13, 2004).
16. D.M. Mihut, **S.M. Aouadi**, J. Turner, S.L. Rohde, "Nanotribological Properties of Nanocomposite CrBN and TiBN Thin Films", American Society of Mechanical Engineers and the Society of Tribologists and Lubrication Engineers International Joint Tribology Conference, Long Beach, CA (Oct. 24-27, 2004).
17. S.L. Rohde, D.M. Mihut, **S.M. Aouadi**, J. Turner, "Nanotribological Properties of Amorphous and Nanocomposite CrBN and TiBN Thin Films", International Surface Engineering Congress & Exhibition, Orlando, FL (Aug. 2-4, 2004).
18. **S.M. Aouadi**, P.K. Shreeman, "Real-Time Spectroscopic Ellipsometry Study of TaN Diffusion Barriers for Copper Interconnects", Prairie Chapter of the American Vacuum Society Meeting, Urbana, IL (June 14, 2004).
19. **S.M. Aouadi**, M. Debessai, T. Maeruf, "Real Time Spectroscopic Ellipsometry Study During the Growth of Nanocrystalline and Nanolaminate Nitride Coatings" International Conference on Metallurgical Coatings and Thin Films, San Diego, CA (April 19 - 23, 2004).
20. Debessai, D.M. Mihut, S.L. Rohde, **S.M. Aouadi**, "Structural, Chemical, Optical and Mechanical Properties of ZrN/Ag Nanocomposite Coatings", International Conference on Metallurgical Coatings and Thin Films, San Diego, CA (April 19 - 23, 2004).
21. P. K. Shreeman, **S.M. Aouadi**, "Real-Time Spectroscopic Ellipsometry Study of Ultra-Thin Diffusion Barriers for Integrated Circuits", International Conference on Metallurgical Coatings and Thin Films, San Diego, CA (April 19 - 23, 2004).
22. T. Maeruf, M. Debessai, K. Farhang, **S.M. Aouadi**, "Mechanical Properties of ZrN/Ni Nanocomposite and Nanolaminate Coatings", International Conference on Metallurgical Coatings and Thin Films, San Diego, CA (April 19 - 23, 2004).
23. D.M. Mihut, **S.M. Aouadi**, M. Debessai, S.L. Rohde, "Micro-Mechanical Properties of Ternary Transition-Metal Nitrides", International Conference on Metallurgical Coatings and Thin Films, San Diego, CA (April 19 - 23, 2004).
24. M. Debessai, **S.M. Aouadi**, Z. Marcano, M. Suarez, M.H. Staia, "Wear and Corrosion Protection of Femoral Implants by Deposition of AgZrN Nanocomposite Thin Films", International Conference on Metallurgical Coatings and Thin Films, San Diego, CA (April 19 - 23, 2004).

**2003:**

25. D.M. Mihut, J. Turner, T.P. Butler, **S.M. Aouadi**, S.L. Rohde, "Nanotribological Properties of Nanocomposite and Amorphous CrBN Thin Films", 50<sup>th</sup> International Symposium of the American Vacuum Society, Baltimore, MD (Nov. 2-7, 2003).
26. M. Debessai, **S.M. Aouadi**, K.C. Wong, K.A. R. Mitchell, F. Namavar, "Optical and Chemical Analysis of Titanium Boron Nitride Nanocomposite Protective Coatings", 25<sup>th</sup> Annual Symposium on Applied Surface Analysis, Urbana, IL (June 3-6, 2003).
27. **S.M. Aouadi**, K.C. Wong, K.A. R. Mitchell, F. Namavar, D.M. Mihut, S.L. Rohde, "Study of the Effect of Ion Implantation of Carbon on TiBN Films", International Conference on Metallurgical Coatings and Thin Films, San Diego, CA (April 29- May 3, 2003).

28. S.L. Rohde, **S.M. Aouadi**, T.Z. Gorishnyy, D.M. Mihut, and E. Schmatz “CrBN Thin Films for Tribological and Biomedical Applications”, International Conference on Metallurgical Coatings and Thin Films, San Diego, CA (April 29 - May 3, 2003).

**2002:**

29. **S.M. Aouadi**, K.C. Wong, K.A. R. Mitchell, F. Namavar, E. Tobin, D. Mihut, and S.L. Rohde, “Characterization of TiCrN Nanocomposite Protective Coatings for Biomedical Applications”, 49<sup>th</sup> International Symposium of the American Vacuum Society, Denver, CO (Nov. 3-8, 2002).

30. D.M. Mihut, T.Z. Gorishnyy, D.M. Schultze, **S.M. Aouadi**, and S. L. Rohde, “Novel Properties of CrBN Films Produced via Unbalanced Magnetron Sputtering”, 49<sup>th</sup> International Symposium of the American Vacuum Society, Denver, CO (Nov. 3-8, 2002).

31. D.M. Mihut, T. Gorishnyy, S. Rohde, **S.M. Aouadi**, “Study on Reactively Sputtered CrBN Thin Films and Their Properties”, International conference on Advanced Materials and Structures, Timisoara, Romania (Sep 19-21, 2002).

32. J. Birch, F. Erikson, **S.M. Aouadi**, F. Schafers, “Sub-Nanometer Tailoring of Interfaces Using Modulated Low Energy Ion Assisted Growth Applied to High Reflectance Multilayer X-ray Mirrors” Eighth International Conference on Plasma Surface Engineering in Garmish-Partenkirchen, Germany (Sep 9-13, 2002).

33. **S.M. Aouadi**, T.Z. Gorishnyy, S. Varma, and S.L. Rohde, “Monitoring and Control of Growth of Cr-B-N Nanocrystalline Coatings Using In-situ Spectroscopic Ellipsometry”, International Conference on Metallurgical Coatings and Thin Films, San Diego, CA (April 22-26, 2002).

34. T.Z. Gorishnyy, **S.M. Aouadi**, S. Varma, and S.L. Rohde “Mechanical and Tribological Properties of CrBN Coatings”, International Conference on Metallurgical Coatings and Thin Films, San Diego, CA (April 22-26, 2002).

35. **S.M. Aouadi**, T.Z. Gorishnyy, J. Chladek, S. Varma, J.A. Turner, S.L. Rohde, “Mechanical, Structural, and Optical Properties of CrBN Coatings”, 45<sup>th</sup> Society of Vacuum Coaters Technical Conference, Lake Buena Vista, FL (April 13-18, 2002).

36. F. Erikson, **S.M. Aouadi**, and J. Birch, “Short Period Ni/V Multilayer X-Ray Mirrors for the N VII emission line in the water window”, The 6<sup>th</sup> International Conference on the Physics of X-ray Multilayer Structures”, Chamonix Mont-Blanc, France (March 2002).

**Prior to 2002:**

37. **S.M. Aouadi**, T.Z. Gorishnyy, F. Namavar, N. Finnegan, and S.L. Rohde, “Characterization of Ternary Nitride Films Using Spectroscopic Ellipsometry”, 48<sup>th</sup> International Symposium of the American Vacuum Society, San Francisco, CA (Oct. 29-Nov. 6, 2001).

38. S.L. Rohde, **S.M. Aouadi**, D.M. Schultze, T.Z. Gorishnyy, and N. Finnegan, “Characterization of CrBN Nitride Films Deposited by Ion Beam Assisted Deposition”, 48<sup>th</sup> International Symposium of the American Vacuum Society, San Francisco, CA (Oct. 29-Nov. 6, 2001).

39. T.Z. Gorishnyy, **S.M. Aouadi**, L.G. Olson, and S.L. Rohde, “Optimization of Wear-Resistant Coating Architecture Using Finite Element Analysis”, 48<sup>th</sup> International Symposium of the American Vacuum Society, San Francisco, CA (Oct. 29-Nov. 6, 2001).

40. T.Z. Gorishnyy, **S.M. Aouadi**, L.G. Olson, and S.L. Rohde “Modeling of Mechanical and Optical Properties of Chromium Nitride Single Layer and Multilayer Films”, VIII International Conference on Physics and Technology of Thin Films, Ivano-Frankivsk, Ukraine (13-19 May 2001).

41. **S.M. Aouadi**, E. Tobin, F. Namavar, T.Z. Gorishnyy, and S.L. Rohde, "Growth and Analysis of Binary and Ternary Nitride Coatings Using Spectroscopic Ellipsometry", 44<sup>th</sup> SVC Technical Conference, Philadelphia, PA (April 2001).
42. **S.M. Aouadi**, K.-C. Wong, K.A.R. Mitchell, S.L. Rohde, "Characterization of Cr<sub>2</sub>N/CrN Multilayer Coatings Produced by Ion-Assisted Reactive Magnetron Sputtering", 47<sup>th</sup> International Symposium of the American Vacuum Society, Boston, MA (Oct. 2-6, 2000).
43. S.L. Rohde, L.G. Olson, **S.M. Aouadi**, D.M. Mihut, B. Neville, D.M. Hornyak, "Tribological Performance and Initial Finite Element Modeling of Reactively Sputtered Single and Multi-Layer Chromium", 47<sup>th</sup> International Symposium of the American Vacuum Society, Boston, MA (Oct. 2-6, 2000).
44. **S.M. Aouadi**, D.M. Hornyak, and S.L. Rohde "Monolithic and Multilayer Cr<sub>2</sub>N/CrN Hard Coatings", 27<sup>th</sup> Annual Symposium of the Rocky Mountain Chapter of the AVS, Arvada, CO (Aug. 21-24, 2000).
45. D.M. Hornyak, S.L. Rohde, L.G. Olson, **S.M. Aouadi**, D.M. Mihut, and B. Neville "Reactively Sputtered Single and Multi-layer Chromium Nitride Based Thin Films", 27<sup>th</sup> Annual Symposium of the Rocky Mountain Chapter of the AVS, Arvada, CO (Aug. 21-24, 2000).
46. S.L. Rohde, D.M. Hornyak, J. White, K.C. Wong, K.A.R. Mitchell, and **S.M. Aouadi**, "Chrome Nitride Growth via Ellipsometric Process Monitoring and Control", International Conference on Metallurgical Coatings and Thin Films, San Diego, CA (April 10-14, 2000).
47. **S.M. Aouadi**, "X-ray Mirrors", VII International Conference on Physics and Technology of Thin Films, Ivano-Frankivsk, Ukraine (Oct. 4-8, 1999).
48. **M.S. Aouadi**, "Development of Functionally Graded Coatings for Space and Aerospace Applications", Fifth International Seminar on Coatings for Aerospace Industry, Toronto, ON (Oct. 23-24, 1997).
49. **M.S. Aouadi** and K. L. Yan, "Development of Novel High-Performance Protective Coatings for Applications in Severe Environments", Proceedings of the 3<sup>rd</sup> CF/CRAD Meeting on Naval Applications on Materials Technology and Inter Naval Corrosion Conference, Halifax, NS (April 22-24, 1997).

#### INVITED PRESENTATIONS

1. **S.M. Aouadi**, "Nanocomposite and Nanotextured Tribological Coatings", University of Cyprus, Cyprus (Mar. 12, 2008).
2. **S.M. Aouadi**, "Nano-Science for Next Generation Biomaterials", Southern Illinois University, School of Dentistry, Edwardsville (Jan. 27, 2007).
3. **S.M. Aouadi**, "Review of Wear Resistant Nanocomposite Coatings", University of Memphis (Oct. 5, 2005).
4. **P. Filip and S.M. Aouadi**, Invited Speaker at the **Microscopy and Microanalysis 2005 Conference, Honolulu, Hawai**. "Microstructure and Related Properties of Nanocomposites for Tribo-Medical Applications", (Jul. 31 – Aug. 4, 2005).
5. **S.M. Aouadi**, Invited Speaker, Argonne National Laboratories, Argonne, IL. "Single- and Multi-Phase Nitride-Based Protective Films" (Jul. 1, 2005).
6. **S.M. Aouadi**, Invited Speaker at the **107<sup>th</sup> Annual Meeting of the American Ceramics Society, Baltimore, MD**. "A Review of Wear Resistant Nanocomposite Coatings", (Apr. 10-13, 2005).

7. **S.M. Aouadi**, "Real Time Spectroscopic Ellipsometry Study of Protective Films", State University of New York, Albany, NY (Sep. 2004).
8. **S. M. Aouadi**, "Characterization of Tantalum Zirconium Nitride Sputter-Deposited Coatings", **Invited Presentation**, University of Illinois Urbana-Champaign, Urbana, IL (Sep. 2003).
9. **S.M. Aouadi**, "Real Time Spectroscopic Ellipsometry Study During the Growth of Nanocrystalline and Nanolaminate Nitride Coatings ", Southern Illinois University, Edwardsville, IL (Oct. 2003).
10. **S.M. Aouadi**, "Fabrication of Ultrahard Nanocrystalline Nitride Coatings for Biomedical Applications", University of Alabama, Birmingham, AL (Mar. 2002).
11. **S.M. Aouadi**, "Fabrication of Ultrahard Nanocrystalline Nitride Coatings for Biomedical Applications", Southern Illinois University Carbondale (Feb. 2002).
12. **S.M. Aouadi**, "In-situ Ellipsometry in the Hard Coating Industry", Linköping University, Sweden (Jan. 2002).
13. **M.S. Aouadi**, "In-Situ Ellipsometry to Control and Monitor Thin Film Growth", Invited Talk, American University of Sharjah, U.A.E. (Oct. 1998).
14. **M.S. Aouadi**, A. Elsayy, P. Combei, P. Zhou and H. Soda, "Development and Evaluation of Yttrium-Silicon-Modified Aluminate Coatings" University of Toronto, ON (March 1998).
15. **M.S. Aouadi**, "Multilayer Mirrors", Univ. College of the Cariboo, Kamloops, B.C. (Nov. 1995).

## **COLLABORATORS**

A. Erdemir (Argonne National Labs), P. Filip (SIUC), Q. Ge (SIUC), R. Haasch (U. Illinois), P. Kohli (SIUC), S.R. Mishra (U. Memphis), S.L. Rohde (U. Nebraska), S. Stadler (SIUC), M. Staia (U. Venezuela), A.A. Voevodin (Air Force Research Laboratory), J.A. Woollam (U. Nebraska)

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## **TEACHING ACTIVITIES**

### **COURSES TAUGHT**

PHYSICS101: Physics that Changed the World (SIUC)  
PHYSICS102: Mechanics and Waves (AUS)  
PHYSICS 103: Electricity and Magnetism (AUS)  
PHYSICS 104: Physics for Architects (AUS)  
PHYSICS 203A: College Physics (SIUC)  
PHYSICS 253/255A: Laboratory Coordinator (SIUC)  
PHYSICS 320: Electricity and Magnetism I (SIUC)  
PHYSICS 530A: Advanced Quantum Mechanics I (SIUC)  
PHYSICS 530B: Advanced Quantum Mechanics II (SIUC)  
METALLURGY 360: Materials Science and Engineering (UNL)  
METALLURGY 861: Advanced Materials Laboratory (UNL)  
METALLURGY 864: Thin Film and Coating Technology (UNL)  
METALLURGY 870: Thermodynamics of Alloys (UNL)

### **RESEARCH STUDENTS ADVISED:**

Ph.D.:

1. Basnyat Prakash. Anticipated Graduation: July 2010.

M.Sc.:

2. Mannakkadu Sheheedah. Anticipated Graduation: December 2008.
3. Yadab Paudel. Anticipated Graduation: July 2008.
4. Basnyat Prakash, "Development of Biocompatible and Self-Lubricating Nanocomposite Films", Graduation: July 2006.
5. Zhang Yu, "Diffusion Barriers for the Next Generation Interconnects", Graduation: April 2006.
6. Tekeste Maeruf, "Fabrication and Characterization of Zirconium Nitride Based Nanocomposite Protective Coatings", Graduation: June 2004.
7. Mathiewos Debessai, "Single and Multi-Phase Nanocrystalline Protective Coatings for Hip Implants", Graduation: June 2004.
8. Students co-advised at the University of Nebraska: Taras Gorishnyy (2000-2002) and Denise Schultze (2000-2001).

Undergraduate:

1. Beth Mehrle (2007): Set-up of a Micro-Raman Spectroscopy System.
2. Brandon Luster (2006-2007), Fabrication and Characterization of protective coatings for high temperature applications.
3. Callie Bradley (2006), Fabrication of Nanoporous membranes and filling them with solid lubricants.
4. Zachary Kertman (2006), Biocompatibility and tribological studies of nanocomposite films.
5. Paul Shreeman (2004-2005), Fabrication and characterization of diffusion barriers for copper interconnects.
6. Aaron Aul (2004-2005), Fabrication and Characterization of protective coatings for biomedical implants.
7. Adam Bonhoff (2004-2005), Fabrication and analysis of nanocomposite thin films.
8. Robert Tomek (2003-2004), X-ray Reflectors. Automated Sputtering System, Fabricated X-ray reflectors and analyzed them using x-ray radiation.
9. Hacene Djemil (2002-2003), Fabrication of protective coatings, Assisted graduate students with deposition. Literature surveys. General lab support.
10. Students co-advised at the University of Nebraska (2000-2002): James Chladek, Nikki Buffington, Shailaja Varma.

**GRADUATE COMMITTEES SERVED ON:**

1. Mohammad Sabra, Ph.D., Thesis Advisor Prof. Malik, Physics (Ongoing)
2. Arjun Pathak, M.Sc., Thesis Advisor Prof. Ali, Physics (July 2007)
3. Chenguang Li, Ph.D., Thesis advisor Prof. Dyer, Chemistry (April 2007)
4. Sailesh Pradhan, M.Sc. Thesis advisor Prof. Mahajan, Mech. Eng. (June 2006)
5. Luke Heroux, M.Sc., Thesis advisor Prof. Migone, Physics (May 2005)
6. Brad Regez, Ph.D., Thesis advisor Prof. Mahajan, Mech. Eng. (October 2004)
7. Munima Haque, M.Sc., Thesis advisor Prof. Malik, Physics (June 2004)
8. Mahmud Khan, M.Sc., Thesis advisor Prof. Ali, Physics (June 2004)
9. Manish Paliwal, M.Sc., Thesis advisor Prof. Mahajan, Mech. Eng. (October 2003)
10. Mohammad Sabra, M.Sc., Thesis advisor Prof. Malik, Physics (July 2003)
11. Khalid Hassan, M.Sc., Thesis advisor, Prof. Malhotra, Physics (December 2002)

## **SERVICE ACTIVITIES**

### **PROFESSIONAL AFFILIATIONS**

1. American Vacuum Society
2. American Physical Society

### **PROFESSIONAL SERVICE**

1. Session Chair, International Conference on Metallurgical Coatings and Thin Films, Biomaterials Session, San Diego, CA (2003, 2004, 2005, 2006, 2007)
2. Proposal Reviewer for NSF-IMR (2006-2007)
3. Proposal Reviewer for Research Corporation, the Petroleum Research Fund, and the U.S. Civilian Research and Development Foundation (CRDF) (2003 and 2007)
4. Reviewed over 60 papers for the Journal of Vacuum Science and Technology, Surface and Coatings Technology, and Thin Solid Films (2000-2007)
5. Book Reviewer for Pearson Addison Wesley (2006)
6. Vice-Chair, ASM International, Great Plains Chapter (2001-2002)

### **UNIVERSITY AND COMMUNITY SERVICE**

1. Initiated Outreach Programs to Local K-12 schools (2005-2007)
  2. Curriculum Committee (2007)
  3. Laboratory Visit, Illinois Junior Science and Humanities Symposium (2003, 2004, 2005, 2006, 2007)
  4. Selection Committee – NSF-REU program (2006-2007)
  5. Undergraduate Student Committee (2004-2007)
  6. Chair of Activities Committee – NSF-REU program (2006)
  7. New Applied Physics Marketing Committee (2005-2006)
  8. External Evaluator, John A. Logan College (2004)
  9. Judge, Internet Science and Technology Fair (2004)
  10. Physics Department Representative, University Open House (June 2003)
  11. Departmental Web Site Committee (2003-2004)
  12. Graduation Ceremonies (2003, 2004, 2007)
  13. Search Committees (2003-2004)
  14. Search Committees (1999-2000)
  15. Developed a new Environmental Science Program (1999-2000)
  16. Developed Physics for Architects Course (1998)
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