

Curriculum Vitae (August 2011): Ian Ivar Suni

Title

Professor, Department of Chemical and Biomolecular Engineering
Adjunct Professor, Department of Chemistry and Biomolecular Science
Director, Materials Science and Engineering PhD program
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Education

Ph.D. in Chemistry (advisor William Klemperer), "The van der Waals Chemistry of Cyanogen," Harvard University, March, 1992.
B.S. in Chemical Engineering, the University of Michigan, April, 1983.

Research and Teaching Experience

Director, Materials Science and Engineering PhD program, 2010-present.
Professor, Dept. of Chemical and Biomolecular Engineering, Clarkson University, 2006-present.
Associate Professor, Dept. of Chemical and Biomolecular Engineering, Clarkson University, 1999-2006.
Assistant Professor, Dept. of Chemical Engineering, Clarkson University, 1993-1999.
Adjunct Professor, Dept. of Chemistry and Biomolecular Science, 1994-present.
Visiting Research Professor II, School of Chemical Engineering, Georgia Institute of Technology, 2000.
Postdoctoral research associate, Dept. of Chemical Engineering (advisor Edmund G. Seebauer), The University of Illinois, 1991-1993.

Research Interests

My current research interests involve application of electrochemistry and electrochemical engineering to technology advancement in thin film growth and dissolution, including both photovoltaic thin films and ULSI materials; electrochemical biosensors, including the use of electrochemical impedance spectroscopy (EIS) for detecting antibody-antigen recognition; and nanotechnology, including the use of nanoporous template materials for alternative energy development and biosensing.

Publications in Peer-reviewed Journals

53. S. Noyel Victoria, J. Jebaraj J.M., I.I. Suni and S. Ramanathan, "Chemical Mechanical Planarization of Ruthenium with Oxone as Oxidizing Agent," submitted to *Electrochem. Solid-State Lett.*

52. G.S. Chojecki, D.H. Rasmusen, K.B. Albaugh and **I.I. Suni**, "Recrystallization of Porous Particulate CIGS Precursors into Dense Thin Films," submitted to *Sol. Energy Mater. Sol. Cells*.
51. A. Krishnamurthy, D.H. Rasmussen and **I.I. Suni**, "Aqueous, Room Temperature Deposition of Si Thin Films," *Electrochem. Solid-State Lett.* **14**, D99 (2011).
50. A. Krishnamurthy, D.H. Rasmussen and **I.I. Suni**, "Galvanic Deposition of Nanoporous Si onto 6061 Al Alloy from Aqueous HF," *J. Electrochem. Soc.* **158**, D68 (2011).
49. J. Jebaraj J.M., D.H. Rasmussen and **I.I. Suni**, "Electrodeposition of CuGaSe₂ from Thiocyanate-Containing Electrolytes," *J. Electrochem. Soc.* **158**, D56 (2011).
48. P.P. Sharma and **I.I. Suni**, "Impedance Analysis of Ru Oxide Reduction in Sulfuric Acid," *J. Electrochem. Soc.* **158**, H111 (2011).
47. P.P. Sharma, **I.I. Suni**, M. Brands and Y. Li, "Poly(ethyleneimine) as a Passivating Agent for Ta Chemical Mechanical Planarization," *Electrochem. Solid-State Lett.* **13**, H416 (2010).
46. S.N. Victoria, P.P. Sharma, **I.I. Suni** and S. Ramanathan, "Potassium Bromate as an Oxidizing Agent in a Titania-based Ru CMP slurry," *Electrochem. Solid-State Lett.* **13**, H385 (2010).
45. R. Singh and **I.I. Suni**, "Minimizing Non-specific Adsorption in Protein Biosensors that Utilize Electrochemical Impedance Spectroscopy," *J. Electrochem. Soc.* **157**, J334 (2010).
44. R. Singh, P.P. Sharma, R.E. Baltus and **I.I. Suni**, "Nanopore Immunosensor for Peanut Protein Ara h 1," *Sens. Actuators B* **145**, 98 (2010).
43. A. Tripathi, **I.I. Suni**, Y. Li, F. Doniat and J. McAndrew, "Cu Electrochemical Mechanical Planarization (ECMP) Surface Quality," *J. Electrochem. Soc.* **156**, H555 (2009).
42. Y. Huang, M. Bell and **I.I. Suni**, "Impedance Biosensor for Peanut Protein Ara h 1," *Anal. Chem.* **80**, 9157 (2008).
41. Y. Huang and **I.I. Suni**, "Degenerate Si as an Electrode Material for Electrochemical Biosensors," *J. Electrochem. Soc.* **155**, J350 (2008).
40. A. Tripathi, C. Burkhard, **I.I. Suni**, Y. Li, F. Doniat, A. Barajas and J. McAndrew, "Electrolyte Composition for Cu Electrochemical Mechanical Planarization (ECMP)," *J. Electrochem. Soc.* **155**, H918 (2008).
39. **I.I. Suni**, "Impedance Methods for Electrochemical Sensors Using Nanomaterials," *Trends Anal. Chem.* **27**, 604 (2008).
38. S. Govindaswamy, A. Tripathi, **I.I. Suni** and Y. Li, "5-Pheny-1-H-Tetrazole as a Low-pH Passivating Agent for Copper Chemical Mechanical Planarization," *J. Electrochem. Soc.* **155**, H459 (2008).
37. A. Tripathi, J. Wang, L.A. Luck and **I.I. Suni**, "Nanobiosensor Design Utilizing a Periplasmic *E. coli* Receptor Protein Immobilized within Au/Polycarbonate Nanopores," *Anal. Chem.* **79**, 1266 (2007).

36. J. Wang, L.A. Luck and **I.I. Suni**, "Immobilization of the Glucose/galactose Receptor (GGR) Protein onto an Au Electrode through a Genetically Engineered Cysteine Residue," *Electrochem. Solid-State Lett.* **10**, J33 (2007).
35. J. Wang, J.A. Profitt, M.J. Pugia and **I.I. Suni**, "Au Nanoparticle Conjugation for Impedance and Capacitance Signal Amplification in Biosensors," *Anal. Chem.* **78**, 1769 (2006).
34. B. Du and **I.I. Suni**, "Electrochemical Dissolution of Ta and TaN Diffusion Barriers," *Electrochem. Solid-State Lett.* **8**, G283 (2005).
33. B. Du and **I.I. Suni**, "Cu Planarization for ULSI Processing by Electrochemical Methods: A Review," *IEEE Trans. Semicond. Manuf.* **18**, 341 (2005).
32. J. Wang, K.A. Carmon, L.A. Luck and **I.I. Suni**, "Electrochemical Impedance Biosensor for Glucose Detection Utilizing a Periplasmic *E. coli* Receptor Protein," *Electrochem. Solid-state Lett.* **8**, H61 (2005).
31. S. Sapra, H. Li, Z. Wang and **I.I. Suni**, "Voltammetry and Impedance Studies of Ta in Aqueous HF," *J. Electrochem. Soc.* **152**, B193 (2005).
30. B. Du and **I.I. Suni**, "Water Diffusion Coefficients During Copper Electropolishing," *J. Appl. Electrochem.* **34**, 1215 (2004).
29. B. Du and **I.I. Suni**, "Mechanistic Studies of Copper Electropolishing in Phosphoric Acid Electrolytes," *J. Electrochem. Soc.* **151**, C375 (2004).
28. Z. Wang, H. Li, H. H. Shodiev and **I.I. Suni**, "Immersion/electroless Deposition of Cu onto Ta," *Electrochem. Solid-State Lett.* **7**, C67 (2004).
27. H. Lin, A.A. Busnaina and **I.I. Suni**, "Investigation of Ionic Contamination Removal from Silicon Dioxide Surfaces," *Surf. Engin.* **18**, 233 (2002).
26. R. Srinivasan, Y. Tian and **I.I. Suni**, "Surface Plasmon Effects on Second Harmonic Generation during Au Nanoparticle Deposition onto Si(111)," *Surf. Sci.* **490**, 308 (2001).
25. **I.I. Suni**, G.W. Gale and A.A. Busnaina, "Dissolution Kinetics for Atomic, Molecular and Ionic Contamination from Silicon Wafers during Aqueous Processing," *J. Electrochem. Soc.* **146**, 3522 (1999).
24. C. Rossiter and **I.I. Suni**, "Atomic Force Microscopy Studies of Au Deposition from Aqueous HF onto Si(111)," *Surf. Sci.* **430**, L553 (1999).
23. R. Srinivasan and **I.I. Suni**, "Kinetic Analysis of Au Deposition from Aqueous HF onto Si(111) by Surface Second Harmonic Generation," *J. Electrochem. Soc.* **146**, 570 (1999).
22. S.V. Babu, **I.I. Suni** and D.H. Rasmussen, "Development of a CD-ROM on Thin Film Technologies: Design, Usability Assessment and Challenges," *J. Engin. Educat. Supplement*, 583 (1998).
21. R. Srinivasan and **I.I. Suni**, "Differential Capacitance Studies of the Specific Adsorption of Thiosulfate on Ag," *J. Appl. Electrochem.* **28**, 993 (1998).

20. R. Srinivasan and **I.I. Suni**, "Electroless Deposition of Au onto Si(111) Studied by Surface Second Harmonic Generation," *Surf. Sci.* **408**, L698 (1998).
19. **I.I. Suni**, "Kinetic Limitations on Metal Dissolution during Aqueous Silicon Wafer Processing," *Electrochem. Solid State Lett.* **1**, 94 (1998).
18. D. Chopra and **I.I. Suni**, "An Optical Method for Monitoring Metal Contamination During Aqueous Processing of Silicon Wafers," *J. Electrochem. Soc.* **145**, 1688 (1998).
17. D. Chopra, **I.I. Suni** and A.A. Busnaina, "Cu Dissolution from Si(111) into an SC-1 Process Solution," *J. Electrochem. Soc.* **145**, L60 (1998).
16. D. Chopra and **I.I. Suni**, "In situ Measurements of Ultrathin Silicon Oxide Dissolution Rates," *Thin Solid Films* **323**, 170 (1998).
15. **I.I. Suni**, "Ellipsometric Thickness Measurements of Ultrathin Silicon Oxides Formed in Aqueous Solutions," *Jap. J. Appl. Phys.* **2** **37**, L712 (1998).
14. **I.I. Suni**, "In situ Optical Studies of Metal Deposition," *J. Appl. Electrochem.* **27**, 1219 (1997).
13. S.M. Ross and **I.I. Suni**, "Adaptive Computer Control in a Hypermedia Materials Science Document," *J. Educ. Multimedia Hypermedia* **6**(3/4), 383 (1997).
12. **I.I. Suni** and S.M. Ross, "Iterative Design and Usability Assessment of a Materials Science Hypermedia Document," *J. Educ. Multimedia Hypermedia* **6**(2), 187 (1997).
11. **I.I. Suni**, "Effect of Three-body Dispersion Interactions on the Surface Dynamics of Ar(111)," *Surf. Sci.* **391**, L1212 (1997).
10. **I.I. Suni**, "Mass Transfer Surface Diffusion of Noble Gases," *Thin Solid Films* **306**, 62 (1997).
9. **I.I. Suni**, "The Mechanism of Surface Hetero-diffusion at Elevated Temperatures," *Surf. Sci.* **349**, L179 (1996).
8. **I.I. Suni** and E.G. Seebauer, "Surface Self-diffusion at High Temperatures: New Simulational Insights," *Thin Solid Films* **272**, 229 (1996).
7. **I.I. Suni** and E.G. Seebauer, "A New Physical Picture for Surface Diffusion at High Temperatures," *Surf. Sci.* **301**, L235 (1994).
6. **I.I. Suni** and E.G. Seebauer, "Surface Diffusion of In on Ge(111) Studied by Optical Second Harmonic Microscopy," *J. Chem. Phys.* **100**, 6772 (1994).
5. K. A. Schultz, **I. I. Suni** and E. G. Seebauer, "Microscopy of Adsorbates by Surface Second Harmonic Generation," *J. Opt. Soc. Am. B* **10**, 546 (1993).
4. **I. I. Suni** and W. Klemperer, "Angular-radial Coupling in the Tunneling Motion of (HCCH)₂," *J. Chem. Phys.* **98**, 988 (1993).
3. K. A. Schultz, **I. I. Suni**, C. E. Allen and E. G. Seebauer, "Optical Second Harmonic

- Study of Sb Adsorption on Ge(111)," *Surf. Sci.* **276**, 40 (1992).
2. S. Lee, **I.I. Suni** and W. Klemperer, "The Rotational Spectrum, Internal Rotation, and Structure of H₂O-NCCN and D₂O-NCCN," *J. Chem. Phys.* **95**, 5577 (1992).
 1. **I. I. Suni**, S. Lee and W. Klemperer, "Preliminary Structural Characterization of Complexes of Cyanogen: NH₃-NCCN and (NCCN)₂," *J. Phys. Chem.* **95**, 2859 (1991).

Grants and Contracts (\$3.7 million total)

31. **I.I. Suni**, "Electrodeposition of Cu₂ZnSnS₄ (CZTS) with controlled stoichiometry," Center for Autonomous Solar Power (CASP), University of Binghamton, \$80,000, 2011-2013.
30. **I.I. Suni** and S. Schuckers, "Impedance-Based Bioelectronic Tongue that Incorporates Antibodies," National Science Foundation, ECCS-1102233, \$345,485, 2011-2014.
29. D.J. Morrison, D.K. Aidun, **I.I. Suni**, and G. Ahmadi, "High-Strength HISC-Resistant Bolt Materials for Seawater/Cathodic Protection Service," General Electric, \$390,000, 2011-2014.
28. **I.I. Suni** and S. Ramanathan (IIT Madras), "Collaborative Studies of Ru Chemical Mechanical Planarization (CMP)," Coulter School of Engineering, Clarkson University, \$4500, 2010-2011.
27. Don H. Rasmussen and **I.I. Suni**, "Smart Responsive Nanocomposites for Soldier Protection: Thin Film II-VI Alloy Materials for Solar Energy Applications," U.S. Army W911NF-05-1-0339, \$165,009, 2009-2010.
- 26b. S.A. Schuckers and **I.I. Suni**, "Transdermal Drug Delivery System with Feedback Mechanism," New World Pharmaceuticals, \$6000, 2009-2011.
- 26a. **I.I. Suni**, "Transdermal Drug Delivery System with Feedback Mechanism," New World Pharmaceuticals, \$85,784, 2009-2011.
26. **I.I. Suni**, S. Schuckers, E. Sazonov, C. Cetinkaya and W. Ding, "Transdermal Drug Delivery System with Feedback Mechanism," New World Pharmaceuticals, \$28,651, 2008-2009.
25. **I.I. Suni**, "Process for Screening Chemical Additives for Ta/TaN Chemical Mechanical Planarization (CMP) Slurries," BASF Aktiengesellschaft, \$62,500, 2008-2009.
- 24a. C. Cetinkaya, W. Ding, F. Hua and **I.I. Suni**, "Research Experience for Teachers (RET): Nanotechnology Undergraduate Education (NUE): Overcoming the Geographic/Infrastructure Disadvantage of a Remote Small Research/Teaching Institution in Nano/micro-scale Engineering Education," National Science Foundation, EEC-0836640, \$20,000, 2008-2010.
24. C. Cetinkaya, W. Ding, F. Hua and **I.I. Suni**, "Nanotechnology Undergraduate Education (NUE): Overcoming the Geographic/Infrastructure Disadvantage of a Remote Small Research/Teaching Institution in Nano/micro-scale Engineering Education," National Science Foundation, EEC-0836640, \$200,000, 2008-2011.
23. Y. Li, G. Ahmadi and **I.I. Suni**, "NYSTAR CAT Development Project, Air Liquide," \$93,808, 2007-2008.
22. **I.I. Suni**, "Limited Research Agreement," Cabot Microelectronics Corp., \$15,582, 2007.
21. Y. Li and **I.I. Suni**, "Optimization of Electrolytes for Copper ECMP," American Air Liquide,

- \$79,873, 2007-2008.
20. **I.I. Suni** and M.A. Twiss, "Smart Responsive Nanocomposites for Soldier Protection: Quartz Crystal Microbalance Studies of Food/Water Pathogens," U.S. Army W911NF-05-1-0339, \$85,494, 2006-2008.
 19. **I.I. Suni** and D.H. Rasmussen, "Electrodeposited Coatings for Metallic SOFC Interconnects," Nanodynamics and NYSTAR, \$175,200, 2006-2008.
 18. **I.I. Suni** and D. Roy, "Formulate an Electrolyte and Electrode Combination for a Low Cost Electrolyte Sensor," Spectron Sensors and NYSTAR, \$87,500, 2006.
 17. Y. Li and **I.I. Suni**, "Investigation of ECMP Processes and Requirements," American Air Liquide, \$75,151, 2005-2006.
 16. **I.I. Suni**, "Smart Responsive Nanocomposites for Soldier Protection: Electrochemical Impedance Biosensors for Food/Water Pathogens," U.S. Army W911NF-05-1-0339, \$79,229, 2005-2006.
 15. **I.I. Suni**, "Impedance Testing of Solid Oxide Fuel Cells," Nanodynamics, \$65,280, 2005.
 14. D.H. Rasmussen, B. Faber and **I.I. Suni**, "Nanotechnology Undergraduate Education (NUE): Introduction to Nanomaterials Science and Engineering," National Science Foundation, EEC-0407261, \$100,000, 2004-2007.
 13. **I.I. Suni**, "Biosensing for Process Control," Center for Advanced Materials Processing (CAMP), Clarkson University, \$25,000, 2004-2005.
 - 12a. **I.I. Suni** and L.A. Luck, "Research Experience for Teachers (RET): Sensors and Sensor Networks: Electrochemical Impedance Architecture for Biosensors," National Science Foundation, CTS-0329698, \$10,000, 2005.
 12. **I.I. Suni** and L.A. Luck, "Sensors and Sensor Networks: Electrochemical Impedance Architecture for Biosensors," National Science Foundation, CTS-0329698, \$300,000, 2003-2007.
 - 11a. **I.I. Suni** and I. Sokolov, "Research Experience for Undergraduates (REU): Nanoscale Exploratory Research (NER): A Novel Nanobiosensor Architecture," National Science Foundation, CCF-0304143, \$5000, 2005.
 11. **I.I. Suni** and I. Sokolov, "Nanoscale Exploratory Research (NER): A Novel Nanobiosensor Architecture," National Science Foundation, CCF-0304143, \$100,000, 2003-2005.
 - 10a. **I.I. Suni**, Reynolds Tech donation of an electroplating tool assessed at \$90,000, 2002.
 10. **I.I. Suni**, "Electroplating onto Semiconductor Materials," Reynolds Tech, \$61,488, 2001-2003.
 - 9a. **I.I. Suni**, "Research Experience for Teachers (RET): Optical Property/structure/process Relationship for Gold Nanoparticles," National Science Foundation, CTS-0094773, \$10,000, 2003.
 9. **I.I. Suni**, "Optical Property/structure/process Relationship for Gold Nanoparticles," National Science Foundation, CTS-0094773, \$214,714, 2001-2004.
 8. **I.I. Suni**, "Copper Electropolishing for Damascene Planarization," Center for Advanced Materials Processing (CAMP), Clarkson University, \$72,000, 2001-2004.

7. A. Busnaina and **I.I. Suni**, "A Study of the Effect of Acoustic Streaming on the Copper Electroplating Process," Reynolds Tech, \$107,147, 1999-2001.
- 6b. **I.I. Suni**, S.V. Babu, D.H. Rasmussen and J. Fendler, "Research Experiences for Teachers (RET): Development and Assessment of Hypermedia-based Instruction in Colloidal Technology," National Science Foundation, \$20,000, 2002.
- 6a. **I.I. Suni**, S.V. Babu, D.H. Rasmussen and J. Fendler, "Research Experiences for Undergraduates (REU): Development and Assessment of Hypermedia-based Instruction in Colloidal Technology," National Science Foundation, \$10,000, 2000-2001.
6. **I.I. Suni**, S.V. Babu, D.H. Rasmussen, J. Fendler and R. Mackay, "Development and Assessment of Hypermedia-based Instruction in Colloidal technology," National Science Foundation, EEC-9872463, \$249,748, 1999-2002.
5. S.V. Babu and **I.I. Suni**, "Nickel Plating," New York State Science and Technology Foundation, \$3000, 1999.
4. S.V. Babu, R. MacKay, A.A. Busnaina, Y. Li and **I.I. Suni**, "Acquisition of Instrumentation for a Thin Film Characterization Facility," National Science Foundation, CTS-9871264, \$158,655, 1998-1999
- 3a. **I.I. Suni** and A.A. Busnaina, "Research Experiences for Undergraduates (REU): A New Technique for Monitoring Metallic Contamination during Aqueous Semiconductor Wafer Processing." National Science Foundation, \$10,000, 1998-1999.
3. **I.I. Suni** and A.A. Busnaina, "A New Technique for Monitoring Metallic Contamination during Aqueous Semiconductor Wafer Processing." National Science Foundation, ECS-9634058, \$188,103, 1997-2000.
- 2a. **I.I. Suni**, "Research Experiences for Undergraduates (REU): Monte Carlo Simulations of the Surface Diffusion of Noble Metals," National Science Foundation, \$10,000, 1996-1997.
2. **I.I. Suni**, "Experimental Studies of Surface Transport Aspects of Electrodeposition and Corrosion," National Science Foundation, CTS-9527497, \$187,339, 1996-1999.
- 1a. S.V. Babu, D.H. Rasmussen, and **I.I. Suni**, "Research Experiences for Undergraduates (REU): Thin Film Technologies: Combined Research-curriculum Development," National Science Foundation, \$30,000, 1995-1996.
1. S.V. Babu, D.H. Rasmussen and **I.I. Suni**, "Thin Film Technologies: Combined Research-curriculum Development," National Science Foundation, EEC-9420571, \$400,000, 1994-1997.