

Shuo Huang

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Education

8/2014 – present	Ph.D., Electrical Engineering Advisor: Prof. Mark J. Kushner	University of Michigan, Ann Arbor, USA
9/2011 – 3/2014	M.E., Electronics Science & Technology Advisor: Prof. Jon Tomas Gudmundsson	Shanghai Jiao Tong University, China
8/2007 – 6/2011	B.E., Electrical Engineering & Its Automation	Southeast University, China

Research Projects

4/2016 – present	Feature scale modeling of plasma etching of high aspect ratio contacts (HARCs) in DRAM – Sponsored by Samsung Electronics	
	- Investigated aspect ratio dependent etching and bowing in HARC etching by Ar/C₄F₈/O₂ mixtures using 3D Monte Carlo Feature Profile Model (MCFPM) - Updated mesh generator for MCFPM to address multiple vias with rectilinear and honeycomb arrangements and different types of contact edge roughness - Investigated interference between adjacent vias during etching and transfer of contact edge roughness from resist into oxide	
8/2014 – present	Reactor scale modeling of selective etching using remote plasma sources for 3D vertical NAND – Sponsored by Samsung Electronics	
	- Developed the reaction mechanism of Ar/NF₃/O₂/HBr and Ar/NF₃/O₂/HCl for selective etching of Si₃N₄ over SiO₂ - Investigated reaction pathway and optimization of radical generation by multiple remote sources and multiple gas inlets using 0D Global_Kin and 2D Hybrid Plasma Equipment Model (HPEM)	
9/2011 – 3/2014	Reactor and sheath scale modeling of dual frequency capacitively coupled plasmas (CCPs) sustained in Cl ₂	
	- Added Cl₂ chemistry into object oriented plasma device for 1 dimension (oopd1) - Investigated ion energy and angular distributions and the effect of two frequencies using oopd1 based on particle-in-cell/Monte Carlo collision method	

Refereed Journal Publications

1. **S. Huang**, V. Volynets, J. R. Hamilton, S. Lee, I.-C. Song, S. Lu, J. Tennyson and M. J. Kushner, Insights to scaling remote plasma sources sustained in NF₃ mixtures, *J. Vac. Sci. Technol. A* **35**, 031302 (2017).
2. J. R. Hamilton, J. Tennyson, **S. Huang** and M. J. Kushner, Calculated cross sections for electron collisions with NF₃, NF₂ and NF with applications to remote plasma sources, *Plasma Sources Sci. Technol.* **26**, 065010 (2017).

3. **S. Huang** and J. T. Gudmundsson, Dual frequency capacitively coupled chlorine discharge, *Plasma Sources Sci. Technol.* **24**, 015003 (2015).
4. **S. Huang** and J. T. Gudmundsson, Ion energy and angular distributions in a dual-frequency capacitively coupled chlorine discharge, *IEEE Trans. Plasma Sci.* **42**, 2854 (2014).
5. **S. Huang** and J. T. Gudmundsson, A current driven capacitively coupled chlorine discharge, *Plasma Sources Sci. Technol.* **23**, 025015 (2014).
6. **S. Huang** and J. T. Gudmundsson, A particle-in-cell/Monte Carlo simulation of a capacitively coupled chlorine discharge, *Plasma Sources Sci. Technol.* **22**, 055020 (2013).

Conference Presentations - Talks

1. **S. Huang**, C. Huard, S. Shim, S. Lee, I.-C. Song, S. Lu and M. J. Kushner, Plasma etching of high aspect ratio contacts in SiO₂ using Ar/C₄F₈/O₂ mixtures: a computational investigation, 63rd *International Symposium of the American Vacuum Society*, Nashville, Tennessee, USA, November 2016.
2. P. Tian, **S. Huang**, S. Shim, S. Lee, I.-C. Song, S. Lu and M. J. Kushner, Control of uniformity and ion energy distributions in tri-frequency capacitively coupled plasmas accounting for finite wavelength effects, 63rd *International Symposium of the American Vacuum Society*, Nashville, Tennessee, USA, November 2016.
3. J. R. Hamilton, **S. Huang**, M. J. Kushner, S. Rahimi, C. Hill, A. Dzarasova and J. Tennyson, Quantemol validated chemistry database: calculated cross sections for electron NF_x collisions as an example, 10th *International Conference on Atomic and Molecular Data and Their Applications*, Gunsan, Republic of Korea, September 2016.
4. **S. Huang**, V. Volynets, S. Lee, I.-C. Song, S. Lu, J. R. Hamilton, J. Tennyson and M. J. Kushner, Optimizing remote plasma sources for selective etching, 43rd *IEEE International Conference on Plasma Science*, Banff, Canada, June 2016.
5. **S. Huang**, V. Volynets, S. Lee, I.-C. Song, S. Lu, J. R. Hamilton, J. Tennyson and M. J. Kushner, Insights to scaling remote plasma sources sustained in NF₃ mixtures, 62nd *International Symposium of the American Vacuum Society*, San Jose, California, USA, October 2015.
6. **S. Huang**, V. Volynets, S. Lee, I.-C. Song, S. Lu, J. R. Hamilton, J. Tennyson and M. J. Kushner, Dry etching of Si₃N₄ using remote plasma sources sustained in NF₃ mixtures, 68th *Gaseous Electronics Conference*, Honolulu, Hawaii, USA, October 2015.
7. **S. Huang**, J. R. Hamilton, J. Tennyson and M. J. Kushner, Remote plasma sources sustained in NF₃ mixtures, 22nd *International Symposium on Plasma Chemistry*, Antwerp, Belgium, July 2015.
8. J. T. Gudmundsson and **S. Huang**, A particle-in-cell/Monte Carlo simulation of a capacitively coupled chlorine discharge, 14th *International Conference on Plasma Surface Engineering*, Garmisch-Partenkirchen, Germany, September 2014.
9. **S. Huang** and J. T. Gudmundsson, Dual frequency capacitively coupled chlorine discharge, *Gordon Research Seminar on Plasma Processing Science*, Smithfield, Rhode Island, USA, July 2014.
10. **S. Huang** and J. T. Gudmundsson, A particle-in-cell/Monte Carlo simulation of a capacitively coupled chlorine discharge, 41st *IEEE International Conference on Plasma Science*, Washington DC, USA, May 2014.
11. J. T. Gudmundsson and **S. Huang**, A particle-in-cell/Monte Carlo simulation of a capacitively coupled chlorine discharge, 66th *Gaseous Electronics Conference*, Princeton, New Jersey, USA, October 2013.

Conference Presentations - Posters

1. **S. Huang** and M. J. Kushner, Multiple remote plasma sources for selective etching, *Gordon Research Conference on Plasma Processing Science*, Andover, New Hampshire, USA, July 2016.
2. J. R. Hamilton, **S. Huang**, M. J. Kushner and J. Tennyson, 22nd *International Symposium on Plasma Chemistry*, Antwerp, Belgium, July 2015.
3. **S. Huang** and J. T. Gudmundsson, A particle-in-cell/Monte Carlo simulation of a dual frequency capacitively coupled chlorine discharge, 67th *Gaseous Electronics Conference*, Raleigh, North Carolina, USA, November 2014.
4. **S. Huang** and J. T. Gudmundsson, Current driven dual-frequency capacitively coupled discharge in chlorine, *The XXII Europhysics Conference on Atomic and Molecular Physics of Ionized Gases*, Greifswald, Germany, July 2014.
5. **S. Huang** and J. T. Gudmundsson, Dual frequency capacitively coupled chlorine discharge, *Gordon Research Conference on Plasma Processing Science*, Smithfield, Rhode Island, USA, July 2014.

Theses

- M.E. Thesis Particle-in-cell/Monte Carlo simulation of single- and dual-frequency capacitively coupled chlorine discharges, Shanghai Jiao Tong University, China, March 2014.
- B.E. Thesis Particle swarm optimization applied in state estimation for IEEE 36-bus network, Southeast University, China, June 2011.