

Daisheng (Neil) Mao

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Education **Northeastern University(NEU)** Boston, MA
Ph.D., Department of Electrical and Computer Engineering. September 2003. Thesis: The Physical and Chemical Mechanisms of TiN Film Deposition of Integrated Circuit Barrier Layers using Ionized Physical Vapor Deposition.

Huazhong University of Science and Technology(HUST) Wuhan, Hubei, P.R.China
Master of Science, Physical-electronics and Optoelectronics, May 1995. Thesis: Study on Gas Molecule Lasers Excited by Confined Discharge.

Zhejiang University(ZJU) Hangzhou, Zhejiang, P.R.China
Bachelor of Science, Department of Optical and Science Instrument. July 1992. Thesis: Design and Implement an instrument for Measuring Optical Linear Diffusion Function.

Technical skills **Tools:** Modeling and simulation of plasma deposition processes and plasma sources.
Design and characterization of RF plasma sources, vacuum systems, and plasma diagnostics.
Skilled in clean room technologies, including wet and dry etching, metal and dielectric deposition, photolithography, E-beam lithography, mask layout and design, electroplating, probe measurement.
Skilled in using analytical and testing equipment for semiconductor industry including experience on SEM, EDS, AFM, FTIR, XPS.
Hands-on experience in optoelectronics. In-depth knowledge of solid-state device physics.

Languages: C/C++, Matlab, VHDL, Verilog, Spice, Perl, Assembly. Proficient with UNIX, Windows NT platforms.

Research experience **NEU Department of Electrical and Computer Engineering** Boston, MA
Advisor: Jeffrey Hopwood
Currently conducting research work on VLSI interconnect technology, focusing on thin film deposition processes for integrated circuit fabrication and computer simulation of plasma deposition process. Fabricated trenches with submicron to nanoscale linewidth by e-beam lithography, ICP and RIE. Performed TiN barrier layer deposition using ionized physical vapor deposition (IPVD). Analyzed thin film characteristics and diagnosed the inductively coupled plasma to obtain the internal plasma parameters. Developed a deposition model of Ti/Nitrogen/Ar ionized physical vapor deposition process. The model describes the TiN film deposition process and the physical and chemical behavior of the Ti/Ar/N₂ inductively coupled plasma in the immediate vicinity of the substrate. Designed and implemented experiments (plasma diagnosis and thin film characterization) to verify plasma and deposition models. (September 1998 – September 2003)

HUST National Laboratory of Laser Technology Wuhan, P.R.China
Group Leader: Qing-Ming Chen
Built a compact Xe gas laser for medical purposes. The project included system building, characterization testing, high frequency power source and a Monte Carlo simulation. The Monte Carlo simulation described electron motion in magnetically confined Xe gas discharge, using C++. Developed control program of GPIB board (IEEE488) to transfer data from digital oscillograph to computer. Designed a 1.55 μm optical filter for WDM, using bulk LiNO₃ as optical material. Designed and developed optical thin film processes for commercial optical lens and lasers. (June 1995 – August 1998)

HUST National Laboratory of Laser Technology

Wuhan, P.R.China

Advisor: Qing-Ming Chen

Conducted research work on magnetically confined Molecule Laser. Results from this work provided a method to improve the performance of Molecule Laser. Work involved building a molecule laser system; testing the laser's characteristics and developing a Monte Carlo simulation of magnetically confined discharge. The Monte Carlo simulation traced electron motion, collision and hall effect under magnetically confining (September 1992 – May 1995)

ZJU Department of optical and science instruments

Hangzhou, P. R. China

Design and implement an instrument for measuring optical linear diffusion function. The instrument includes a power source to transfer AC 220V to DC 12V and DC 5V, a printed circuit board to control a stepper motor, a printed circuit board to amplify measured voltage signal and convert analog signal to 8-bit digital signal.

Presentations

"The Influence of High Density Plasma on TiN Films Deposition by Ionized Physical Vapor Deposition ", D. Mao, J. Hopwood, K. Tao, AVS 47th International Symposium, Boston, Massachusetts, October 2000.

"Modeling and Experimental Verification of a Ti/Nitrogen/Ar Ionized Physical Vapor Deposition Tool", K. Tao, D. Mao, J. A. Hopwood, AVS 47th International Symposium, Boston, Massachusetts, October 2000.

"Modeling and Experimental Characterization of a Ti/Nitrogen/Ar Ionized Physical Vapor Deposition Tool", K. Tao, D. Mao, J. A. Hopwood, AVS 46th International Symposium, Seattle, Washington, October 1999.

"Continuous Wave Near-infrared Atomic Xe Laser Excited by Magnetically Confined discharge", D. Mao, Q. M. Chen, J. Hu, Proceedings of International Conference on Lasers '97, New Orleans, Louisiana, December 1997.

"Two Fluoride Compounds for IR Thin Films", J. Hu, Q. M. Chen, D. Mao, Proceedings of International Conference on Lasers '97, New Orleans, Louisiana, December 1997.

"Electron Dynamic in Magnetically Confined CO Laser Discharges", D. Mao, Q. M. Chen, J. J. Pan, Proceedings of International Conference on Lasers '95, Charleston, Arizona, December 1995.

Publications

"Ionized physical vapor deposition of titanium nitride: A deposition model", D. Mao and J. Hopwood, in preparation.

"Ionized physical vapor deposition of titanium nitride: Plasma and film characterization", D. Mao, K. Tao, and J. Hopwood, J. Vac. Sci. Technol. A. 20(2), p. 379, 2002.

"Ionized physical vapor deposition of titanium nitride: A global plasma modeling", K. Tao, D. Mao, and J. Hopwood, J. Appl. Phys. 91(7), p. 4040, (2002).

"The investigation of magnetically confined discharge CO lasers", T. Wang, Q. Cheng, and D. Mao, Applied Physics B: Lasers and Optics, Vol. 72, p. 599, (2001).

"Monte Carlo simulation of electron motion in magnetically confined CO gas laser discharges", Daisheng Mao and Qing-Ming Chen, Journal of Physics: D, Applied Physics, Vol. 28, p. 1111, (1995).

Activities

Student membership, Institute of Electrical and Electronics Engineers (IEEE) (2001 - present)

Student membership, American Vacuum Society (AVS) (1999 - present)

President, Northeastern University Chinese Student and Scholars' Association (2000 – 2001)