

Plasma and RF Fundamentals

Course Overview

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Plasma & RF Fundamentals (104): Course Overview

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About This Course

- Part of a series that builds a knowledge foundation for understanding plasma technology & RF energy.
- Concepts and principles covered include:
 - Plasma principles; particle behavior in plasma; ionization, dissociation, recombination; stages & regions of a plasma; plasma simulation; threshold for plasma ignition; effects of power & pressure; foundations of RF power and electrical properties of plasma; changes in electromagnetic waveforms and related variables affecting RF plasma applications; self-DC biasing in plasma processes; RF power & plasma performance (animation); magnetron, ECR, & inductively coupled plasmas; plasma applications.



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Courses in This Series

- Plasma and RF Fundamentals (104)
- RF Generators and RF Safety (105)
- RF Impedance Matching (106)
- RF Transmission Lines (107)
- RF Power Measurement and Control (108)



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Course Outline

- Introduction Module 0
- The Plasma Phenomenon Module 1
- Igniting a Plasma - Lab Module 2
- RF Energy Module 3
- Industrial Plasma Optimization and Uses Module 4
- Semiconductor Applications – Research Module 5
- Performance Assessment (Multiple-Choice Test)



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Learning Objectives – Learn about...

- Plasma-enhanced semiconductor manufacturing processes and applications
- How to obtain the desired results using RF plasma-enhanced processing
- Control parameters required to achieve optimal conditions for plasma creation
- How to use RF energy to create RF plasmas and control their properties
- Optimizing techniques in plasma-enhanced processed and equipment



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Learning Objectives (1)

- Define a plasma.
- Describe what happens during excitation and relaxation.
- Explain what makes a plasma glow.
- Explain why the color emitted by plasma gases is important to semiconductor processes.
- Ignite and study a plasma through an interactive simulator lab.



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Learning Objectives (2)

- Describe the characteristics of the most common frequency used in RF energy production.
- Explain why frequencies have been specified and controlled.
- Describe why and how RF energy improves plasma performance.
- Explain the effect of & how to control self-DC bias.
- Explain the electrical model of a plasma.
- Explain how anisotropic etch, plasma-enhanced deposition, step coverage, and plasma cleaning processes are accomplished.

Learning Objectives (3)

- Describe how and why plasma facilitates different semiconductor manufacturing technology (SMT) processes.
- Read reports and articles on plasma-enhanced SMT, and identify plasma principles responsible for results reported, process improvements made, benefits and impact to SMT.
- Use the Internet to conduct research on plasma-related topics.
- Summarize research findings in a matrix format.

Skills

- Draw a model that explains particle behavior when an argon plasma “multiplies”
- Estimate control parameter settings in a plasma simulation where plasma ignition is optimal (simulation)
- Read reports and articles on plasma-enhanced SMT, and identify plasma principles responsible for results reported, process improvements made, benefits and impact to SMT
- Conduct research on plasma using the Internet
- Summarize research findings in a matrix format

Additional Course Information

- Instructional Area: Manufacturing Technology
- Participant Level: A.A. or A.A.S. degree or equivalent (Technician Training)
- Prerequisites: None
- Target Competency: Learners will apply basic knowledge of plasma principles and RF power fundamentals to managing, optimizing, and controlling plasma-enhanced semiconductor manufacturing processes and equipment.

Course Developers

■ MATEC:

- ☐ Instructional Design: Kim Grady and Joseph Mattoon
- ☐ Instructional Developer: Kim Grady
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- ☐ Instructional Support: Becky Shingler

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■ Content Repurposing, Expert Review, and Updates:

- ☐ MATEC and Semizone



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Who Should Take the Course

■ Semiconductor wafer fab personnel:

- ☐ Equipment technicians and operators
- ☐ Repair and maintenance technicians
- ☐ Process technicians

■ Semiconductor wafer fab new hires

■ Semiconductor equipment industry personnel

■ Sales, Marketing, and Service personnel

■ Anybody interested in learning about plasmas

■ Course designed to fulfill employment-ready competency needs for fab technicians



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Course Organization and Delivery

- Self-paced online modules comprising HTML-based lessons and animations
- Course available for access on demand, anytime and anywhere
- One-year course access upon enrollment
- Final performance assessment:
 - ☐ Multiple-choice quiz (required for certificate)
- Course certificate by Semizone and MATEC



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