

VORLESUNG

High-frequency technology and engineering aspects for technical plasmas

Following an introduction to the economic significance and structure of the semiconductor and MEMS industries - key users of plasma technologies - a brief analysis of the individual market segments and the market for radio-frequency plasma equipment is presented. The market for plasma equipment serving the semiconductor and MEMS industries is of great strategic importance and has reached now a volume exceeding € 50 billion.

Technical Focus Areas

1. High-frequency technology and substrate handling for semiconductor applications
2. Practical physics and chemistry of reactive plasmas
3. Plasma processes
4. Industrial plasma equipment: etching, deposition, sputtering
5. Introduction to deep silicon etching (MEMS)

The measurement of plasma chamber impedance is explained, and data from semiconductor industry plasma etchers illustrate the typical parameter ranges found in complex production systems. Against the backdrop of current challenges in manufacturing sensors (MEMS) for smartphones (IoT) - which require rapid switching of process conditions (such as deep silicon etching via the Bosch process) - the discussion concludes with a system-theoretic analysis of control engineering issues. Specifically, it addresses the cascading of subsystems in plasma equipment during rapid parameter changes associated with pulsed plasma processes.

Electrostatic substrate clamping with helium backside cooling has long been the standard for plasma processing in the semiconductor industry. This clamping method offers significant advantages, such as uniform substrate temperature distribution and the avoidance of mechanical damage to the substrate. However, the non-ideal behavior of dielectrics within the process plasma and their interaction with the plasma itself create issues that often result in insufficient clamping force or substrate sticking. Both phenomena are explained using models and practical examples; illustrative samples are available.

Lecturer

Dr. Michael Klick

Time schedule and location

The lecture will given in English and will take place in person from October 5 to October 9, 2026, ID 03/411.

Monday	11:00 – 17:00 Uhr
Tuesday	9:00 – 16:30 Uhr
Wednesday	9:00 – 16:30 Uhr
Thursday	9:00 – 16:30 Uhr
Friday	9:00 – 15:30 Uhr

Language and script

The lecture notes are in English and will be distributed as a printout.

Application

Interested students are asked to register briefly. Please also include your student ID number and degree program when emailing doris.fischer-niess@ruhr-uni-bochum.de, cc: michael.klick@plasmatrex.com.



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