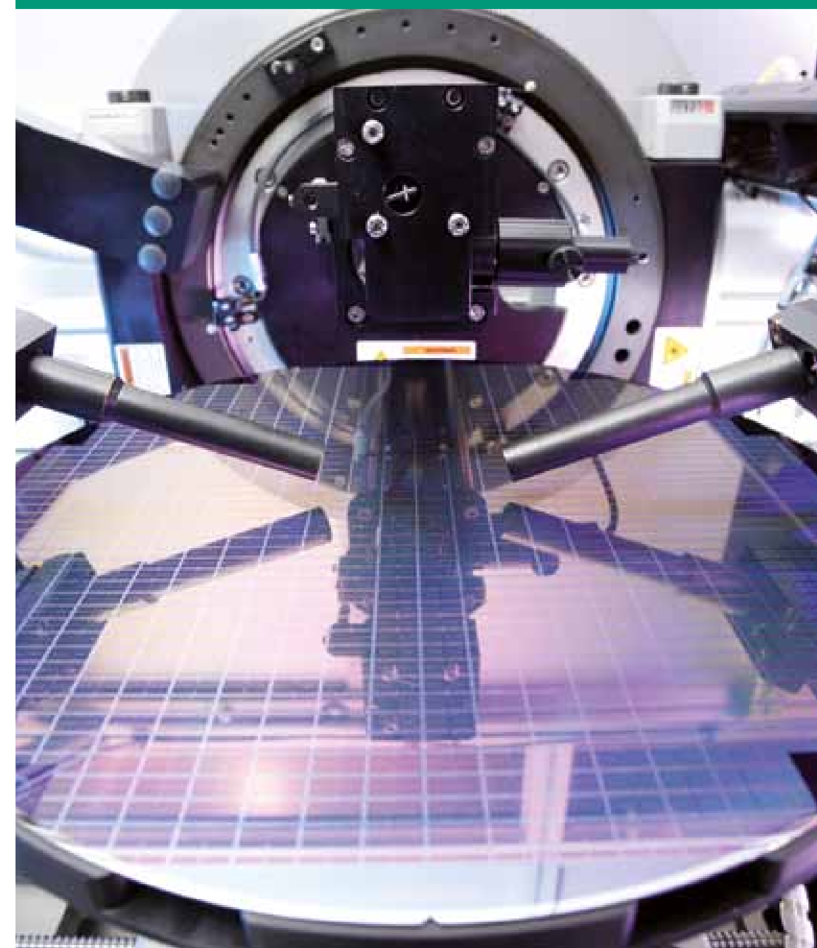
Fraunhofer IISB

FRAUNHOFER-INSTITUT FÜR INTEGRIERTE SYSTEME UND BAUELEMENTETECHNOLOGIE IISB

METROLOGY

FOR EQUIPMENT CHARACTERIZATION



RESEARCH AND DEVELOPMENT PORTFOLIO

Measurement Techniques

- Spectroscopic ellipsometry and reflectometry
- Optical scatterometry
- X-ray techniques
- Wafer and defect inspection
- Scanning electron microscopy
- Integrated and *in situ* metrology

Competences

- Application of metrology for equipment characterization
- Metrology systems, sensors, and algorithms
- Metrology for Advanced Process Control (APC)
- Advanced metrology data analysis
- Determination of optical properties of new materials in the vacuum-UV
- Chemical analysis of surfaces, thin layers, media, and components

CONTACT

Fraunhofer Institute for
Integrated Systems and Device Technology IISB
Schottkystrasse 10
91058 Erlangen, Germany

www.iisb.fraunhofer.de

Dr. Georg Roeder
Phone: +49 9131 761 234
E-mail: georg.roeder@iisb.fraunhofer.de

Dipl.-Ing. Martin Schellenberger
Phone: +49 9131 761 222
E-mail: martin.schellenberger@iisb.fraunhofer.de

Fax: +49 9131 761 112

PROVIDING UNIQUE SERVICES FOR STAND-ALONE, INTEGRATED, AND *IN SITU* METROLOGY

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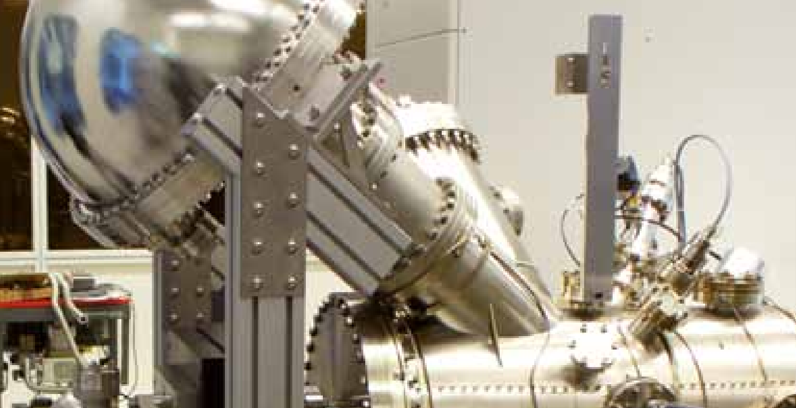

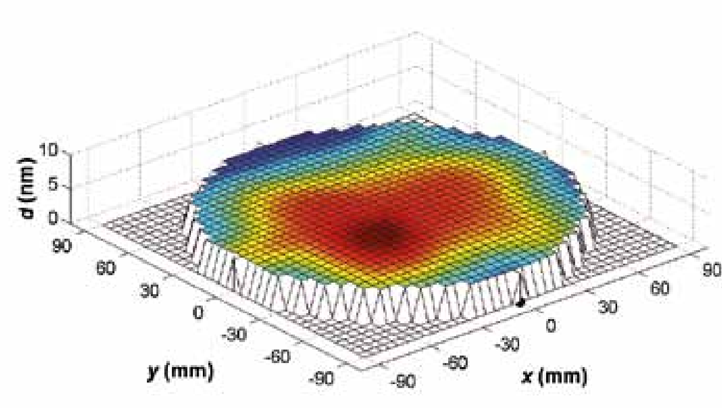

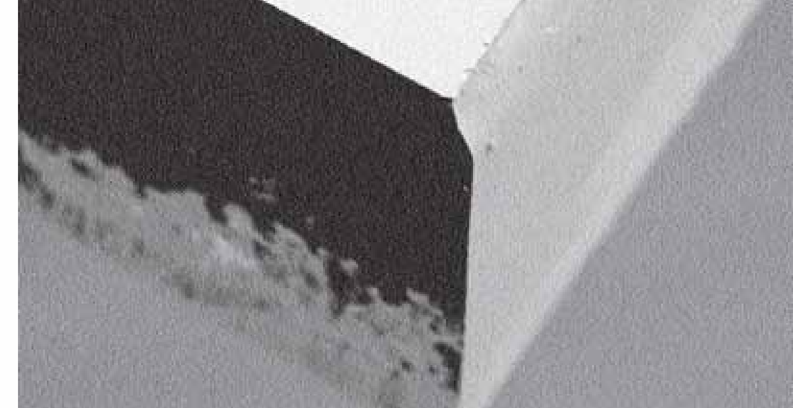

INSTRUMENTATION

- Deep-UV to mid-infrared multi-angle spectroscopic ellipsometry and vacuum-UV spectroscopic reflectometry
- Integrated and stand-alone photoelectron spectroscopy (XPS) and angle-resolved x-ray photoelectron spectroscopy (ARXPS)
- Wave front sensors for local determination of topography and flatness
- Capacitive gauge for determination of wafer geometry
- Particle measurement systems for wafer inspection
- Ultra-trace analytical equipment for environment, materials, and on silicon wafers (TXRF, AAS, ICPMS, GCMS)
- Particle counters for airborne and liquid particle contamination
- Portable scanning electron microscope with resolution down to 100 nm
- *In situ* optical emission spectroscopy and mass spectrometry

MEASUREMENT SERVICES

- Full equipment and process characterization at the IISB labs
- Thorough equipment and process characterization on site at the user's fab
- Measurements for wafer and process characterization from test samples to 300 mm wafers
- Layer and surface characterization, model development, simulation studies, analysis of thickness, morphology, and structure
- Determination of wafer geometry and flatness on non-patterned and patterned wafers
- Particle measurement and analysis of chemical contamination on wafers
- Chemical analysis of media and components
- Equipment and process characterization by integrated and *in situ* metrology

EXAMPLES OF RESEARCH AND DEVELOPMENT

- Material characterization for layer deposition, e.g. for pulsed MOCVD, sputter deposition, and plasma nitridation equipment
- Development of scatterometry and algorithms, e.g. Phi-Scatterometry equipment and algorithms for rapid scatterometry analysis
- Development of defect inspection and flatness measurement tools
- Application of *in situ* single-wavelength and spectroscopic ellipsometry for process control in thermal oxidation, layer deposition, and dry-etching
- Characterization by optical emission spectroscopy and mass spectrometry, e.g. of MOCVD, plasma etch, plasma deposition, and plasma immersion implantation equipment