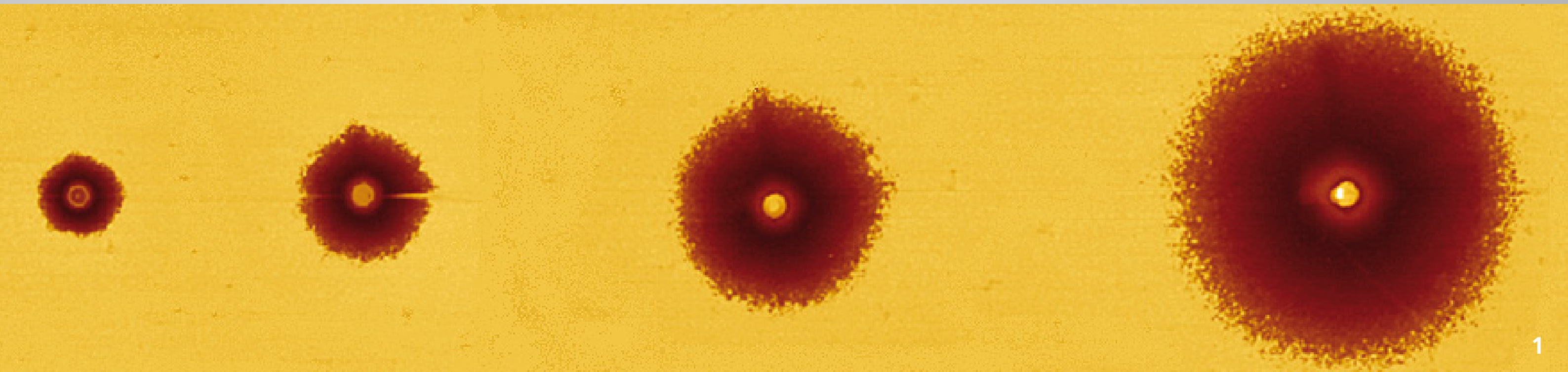
Fraunhofer

IISB

FRAUNHOFER INSTITUTE FOR INTEGRATED SYSTEMS AND DEVICE TECHNOLOGY IISB



1 *SSRM measurement showing the damage caused by a FIB Ga+ beam in Si for four different doses (scan size 90 x 20 µm²)*

SCANNING PROBE MICROSCOPY

CUSTOMIZED SERVICES AND SOLUTIONS

Our objectives

- Providing services and solutions for electrical and topographical analysis
- Assisting customers in complex research issues

Features

- Topographical measurements with nanometer resolution
- PeakForce Tapping and Quantitative Nanoscale Mechanical Characterization (QNM)
- Electrical measurements
- Contactless electrical KPFM
- Dark lift measurements
- Temperature chuck

Advantages

- Long-term research and service experience
- Complementary characterization techniques available
- Complete in-house sample preparation
- Access to a broad spectrum of probes

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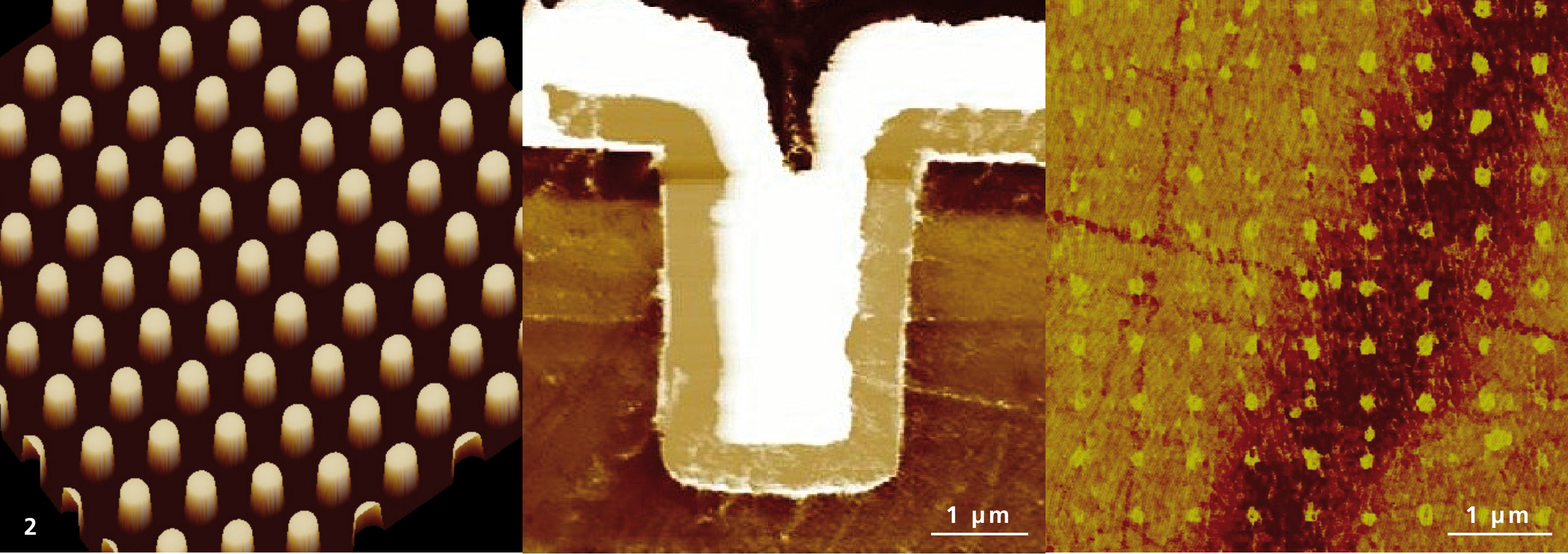


FRAUNHOFER IISB OFFERS IN-DEPTH ANALYSIS, CHARACTERIZATION AND PREPARATION OF SAMPLES

Competences

- Topography
  - High aspect ratio probes for abrupt changes in topography (e.g. trenches, pillars)
- Conductive AFM (c-AFM)
  - Local constant voltage stress (CVS) analysis
- Scanning Spreading Resistance Microscopy (SSRM)
  - Quantification with IMEC reference sample
- Kelvin Probe Force Microscopy (KPFM)
- Scanning Capacitance Microscopy (SCM)

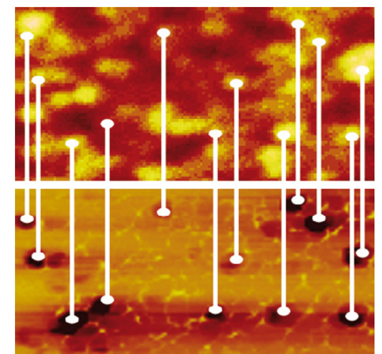
Applied research

- Dielectric thickness measurement of high-k gate materials via KPFM
  - Combining surface potential and topography measurement
- Characterization of process-induced modification of electrical sample properties

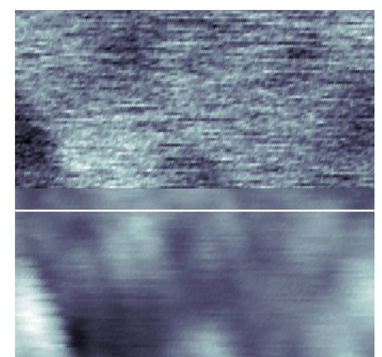
Equipment

- Bruker Dimension ICON and Bruker Dimension 5000
- Maximum scan size up to 110 x 110 µm²
- Sample sizes up to 300 mm wafers
- Temperature chuck for low and high temperature measurements (-35 °C up to 200 °C, in N_2 atmosphere)
- Application modules for electrical measurements (c-AFM, TUNA, ext. TUNA, SSRM, SCM)
- In-house sample preparation capabilities

2 Topography of pillars (2 µm height) using high aspect ratio probes (scan size: (50 µm)²), SSRM of a trench gate with differently doped areas, c-AFM map after local I/V measurements with corresponding oxidation spots (from left to right)



3 Topography and c-AFM measurement showing leakage current of TiO_2 on RuO_2 (scan size each 1 x 0.5 µm²)



4 Contact potential difference (top) and evaluated equivalent oxide thickness (bottom, ~ 8.5 nm) using KPFM (scan width 250 nm)