alpha300
Focus Editions

alpha300 Semiconductor Edition

Large-area wafer inspection for the semiconductor industry

The alpha300 Semiconductor Edition is a high-end confocal Raman microscope specifically configured for the chemical imaging of semiconducting materials. It helps researchers accelerate the characterization of crystal quality, strain and doping. The microscope's extended-range scanning stage enables the inspection of up to 300 mm (12 inch) wafers and the acquisition of large-area Raman images. It is equipped with active vibration damping and active focus stabilization to compensate for topographic variation during measurements over large areas or long acquisition times. All microscope components are fully automated, permitting remote-control and the implementation of standard measurement procedures.

Key features

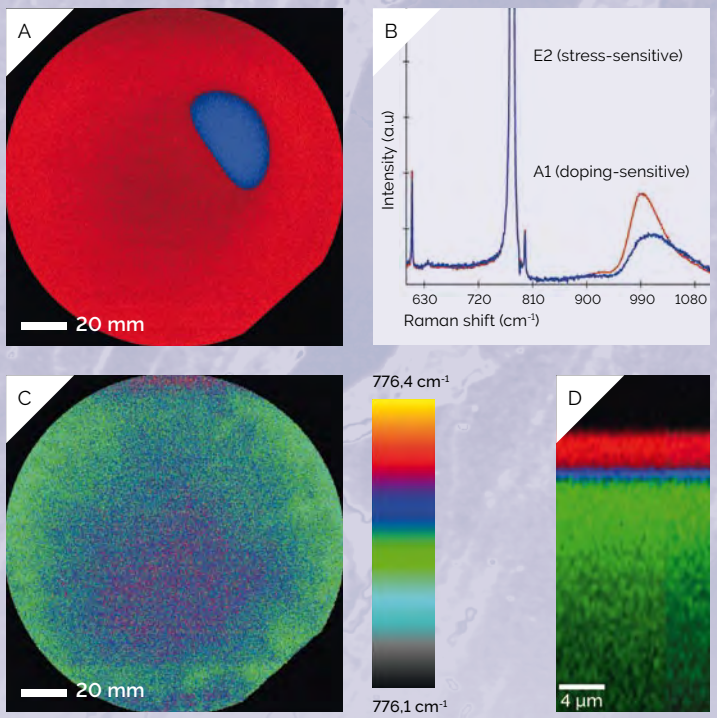
- Industry-leading confocal Raman microscope for high speed, sensitivity and resolution – simultaneously
- Scientific-grade, wavelength-optimized spectrometer for high signal sensitivity and spectral resolution
- Large-area scanning (300 x 350 mm) for wafer inspection
- Active vibration damping and focus stabilization for long-acquisition-time and large-area measurements
- Extensive automation for remote-control and recurring measurement workflows
- WITec Software Suite for data acquisition and advanced post-processing
- White-light illumination for sample overview

https://raman.oxinst.com

Applications

Large-area wafer inspection

In this example, the entire surface of a 150 mm (6 inch) silicon carbide (SiC) wafer was imaged with Raman microscopy in order to reveal areas of strain and inhomogeneous doping. To obtain a sharp Raman image of the entire wafer, the surface was kept in focus by TrueSurface technology. Additionally, a depth scan through an epitaxially overgrown SiC wafer was recorded to visualize the distribution of different layers.

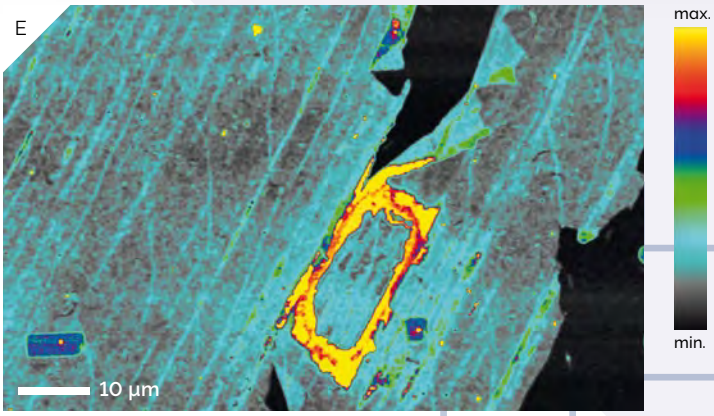


(A/B) Confocal Raman image of a 150 mm SiC wafer. TrueComponent Analysis identified two spectra, which mainly differed in the doping-sensitive A1 peak (ca. 990 cm^{-1}). The image reveals an oval region (blue) with a different doping concentration than the bulk wafer area (red). **(C)** Confocal Raman image of a 150 mm SiC wafer, color-coded for the position of the stress-sensitive E2 peak (776 cm^{-1}). The image reveals a small, presumably stress-induced peak shift from the wafer's center toward its edge. **(D)** Raman depth scan of an epitaxially overgrown SiC wafer, showing a thin interface layer (blue) between the wafer substrate (green) and the 10 µm-thick epitaxial layer (red).

Sample courtesy of the Fraunhofer Institute for Integrated Systems and Device Technology IISB, Erlangen, Germany.

2D materials analysis

Confocal Raman imaging is well-suited to characterizing conventional semiconducting materials such as silicon (Si), silicon carbide (SiC), gallium nitride (GaN) and gallium arsenide (GaAs), and also novel 2D materials including graphene, perovskite, molybdenum disulfide (MoS_2), tungsten diselenide (WSe_2) and other transition metal dichalcogenides (TMDs) and heterostructures.



(E) High-resolution Raman image of CVD-grown graphene, color coded according to the D-band intensity, which depends on the defect density in the carbon lattice.

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