

1 *High resolution UV- $\mu$ -PCD minority carrier lifetime map of PV silicon material (scan size 150 x 35 mm<sup>2</sup>, 125  $\mu$ m resolution)*

## CONTAMINATION ANALYSIS

### CHARACTERIZATION OF ELECTRICALLY ACTIVE CONTAMINANTS

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#### Our objectives

- Providing customized solutions for process quality monitoring
- Assisting customers in electrical failure analysis

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#### Features

- Quality monitoring for both, mono- and polycrystalline materials
- Monitoring of process cleanliness
- Visualization of contamination source by carrier lifetime mapping
- Determination of electrically active contaminants with highest sensitivity
- In-depth analysis and identification of defects

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#### Advantages

- Complementary characterization techniques available
- Long-term research and service experience
- Short response time

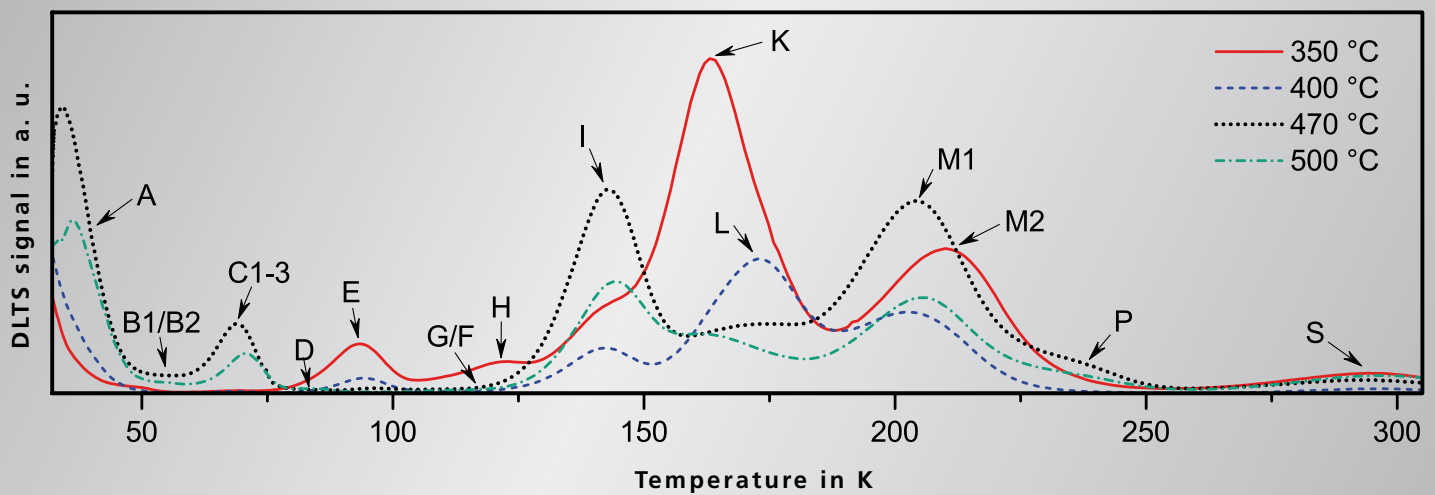
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**Competences**

Minority carrier lifetime

- Microwave detected Photo Conductivity Decay ( $\mu$ -PCD)
- Si, SOI, and SiC
- High resolution mapping
- Real bulk lifetime for oxidized samples by Charge-PCD

Surface photovoltage (SPV)

- Si only
- No surface passivation required
- Real bulk diffusion length for highly contaminated samples
- Enhanced reliability of results due to excitation by eight lasers
- Reliable Fe concentration determination (optical FeB dissociation)

Deep level transient spectroscopy (DLTS)

- Si and SiC
- Determination of trap concentrations and characteristics
- Depth profiling by voltage variation or sample beveling
- In-house sample preparation (Schottky contact deposition, beveling)

Complementary chemical contamination analysis

- Inductively coupled mass spectrometry (ICPMS)
- Sample preparation by vapor phase decomposition (VPD)

**Equipment**

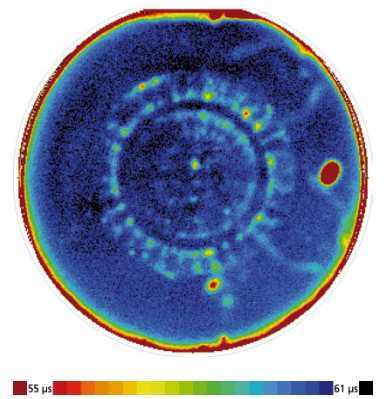
Semilab WT-2500 platform

- Arbitrary pieces and wafers with up to 300 mm diameter
- Microwave detected photoconductivity decay ( $\mu$ -PCD) for Si and SiC
- IR (905 nm) and UV (350 nm) laser excitation
- Down to 62.5  $\mu$ m measurement raster
- Surface photovoltage (SPV) for Si
- Eight laser excitation (1010, 975, 950, 905, 875, 850, 780, 655 nm)
- Fe concentration mapping for p-Si (SPV or  $\mu$ -PCD)
- Contactless oxide characterization (CET,  $Q_{ox}$ ,  $D_{it}$ )

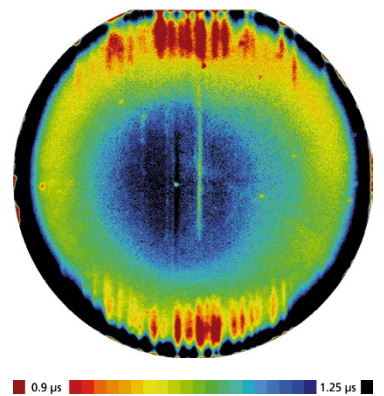
PhysTech Hera DLTS

- Deep level transient spectroscopy (DLTS) (appr. 20 K - 800 K)

2 DLTS temperature scans for proton irradiated samples, annealed at different temperatures. Identified peaks are indicated by letters



3  $\mu$ -PCD fingerprint of a wafer chuck (150 mm Si wafer)



4 High resolution UV- $\mu$ -PCD carrier lifetime map of 3" 4H-SiC epitaxial wafer