

Failure Analysis at Infineon Technologies

- Failure Analysis Infineon: HC ca.250 w/w, 180 Europe
- Product FA for all Business Groups Munich & Corporate FA functions + support Munich Fab (5 groups, HC ca 80):
 - ↳ FA roadmap, Readiness for new technologies
 - ↳ Internal coordination, External Representation
 - ↳ VDE, EDFAS, SEMATECH, ESREF, ISTFA, IPFA
- Manufacturing assisting PFA groups
 - ↳ FE 8 sites, 6 in Europe
 - ↳ BE 5 sites, 3 in Europe
 - ↳ joint evaluation, investment, roadmap, metrics

Failure Analysis at Infineon Technologies

■ FA roadmap:

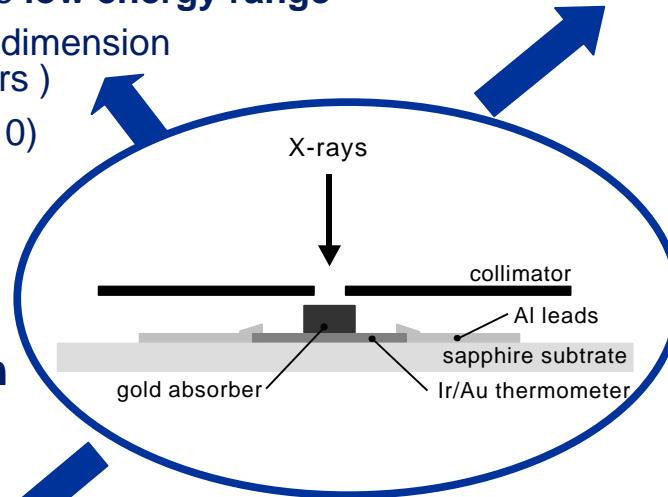
- ↪ Backside Analysis (Photoemission, Laser Scanning, LVP, FIB, thermography)
- ↪ Inline Analysis (FIB etc.)
- ↪ Design for Analysis
- ↪ AFM derivatives (funded by government)
- ↪ conductive AFM
- ↪ Microcalorimeter EDX (funded by EU SEA)
- ↪ Preparation of new materials

■ Integration into development business processes

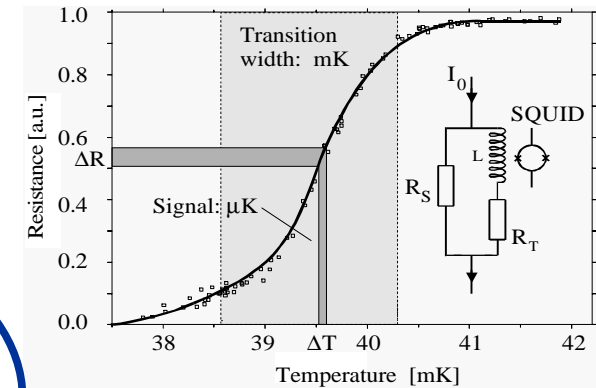
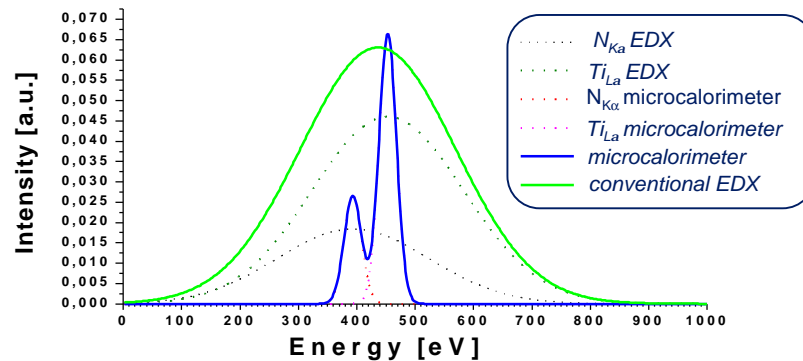
Microcalorimeter - principle of the detector

Energy-dispersive method for material analysis

- detection of characteristic X-ray radiation
- suitable especially in the **low energy range**
 - ⇒ structures of small dimension (particles, thin layers)
 - ⇒ light elements ($Z < 10$)



energy resolution
in comparison to conventional EDX



Characteristic of the superconducting Ir/Au-film
small variation in temperature
⇒ big variation in resistivity

necessary temperatures below 100 mK are realized by a mechanical cryostat

Calculated resolution of the Ti La-line and the N Ka-line ($\Delta E = 60$ eV)

conventional EDX 130 eV
microcalorimeter 15 eV

Assessment of the detector / MESA*

Equipment

- Usually serves as detector in astrophysical applications; is very sensitive to energy of incident radiation
- the detector is installed at a scanning electron microscope
- Supplier: **CSP Cryogenic Spectrometers GmbH**

Idea

- apply the detector to analytics of semiconductor technology and failure analysis
- problems of future technologies and materials can be solved with this tool, while the conventional EDX method fails

Assessment

- assessment of the detector and the mechanical cryostat in a SEA project (MESA*) funded by the European Commission
- **milestones**
 - initial assessment
 - equipment improvements
 - final assessment of improved equipment
 - concept for an inline application

* **Microcalorimeter Type EDX System Assessment**