

# Materials and Failure Analysis

## Materials Analysis

**Sulzer Innotec**

Macroscopic and microscopic characterisation and analyses of all classes of materials: metals, ceramics, composites and their respective oxidation, corrosion and reaction products. Identification of solid and liquid substances. Qualitative and quantitative examination and characterisation of treated and untreated surfaces, fracture surfaces and coatings.

### Makroskopic chemical and structural analysis

- X-Ray Fluorescence Analysis (Metals, Ceramics, Powders, Oils)
- Gas Extraction Analysis (O, N, H)
- Combustion Analysis (C, S)
- X-Ray Diffractometry (Phases, composition, corrosion products)

| Element | (Gew.%) |
|---------|---------|
| C       | 0.32    |
| Al      | <0.010  |
| Si      | 0.20    |
| P       | 0.010   |
| S       | 0.015   |
| Ti      | <0.010  |
| V       | <0.010  |
| Cr      | 0.96    |
| Mn      | 0.82    |
| Co      | 0.012   |
| Ni      | 0.15    |
| Cu      | 0.25    |
| Nb      | <0.010  |
| Mo      | 0.16    |
| W       | 0.014   |
| Fe      | Basis   |



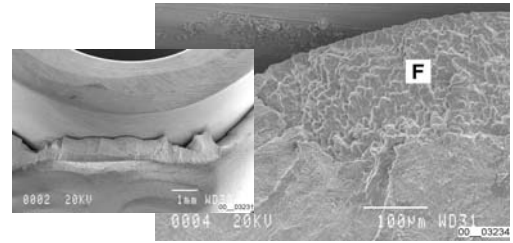
Defective bearing casing – was the right material used?

### Micro- and Nano Analyses and Characterisation

- Scanning Electron Microscope (SEM) with state-of-the-art EDX analysis
- Electron Probe Microanalysis (EPMA) for quantitative microanalysis and element mapping
- Atomic Force Microscopy (AFM)



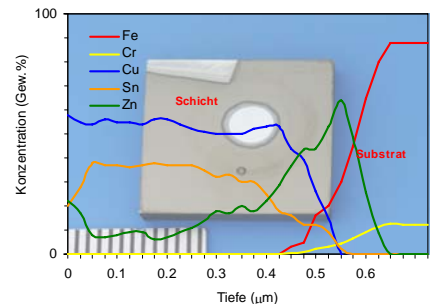
Our Scanning Electron Microscope (SEM)



SEM Micrograph of a fracture surface: left, overview; right, detail

### Surface and through thickness elemental distribution

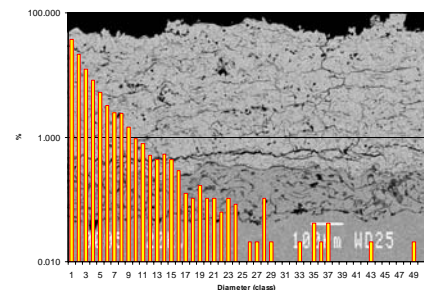
Glow Discharge Optical Emission Spectroscopy (GDOS) for analysing coatings (CVD, PVD, galvanic coatings, surface treatments (passivation etc.) and other surface features (oxides, films etc.)



GDOS-Depth profile of a defective galvanic coating

### Additional methods and techniques

- Quantitative image analysis (inclusions, porosity, structures, phase analysis, etc.)
- Particle size distributions (relative amounts, size distribution)
- Measurement of specific surface area
- Analysis of processing media
- Determination of coefficient of thermal expansion CTE



Quantitative image analysis: Determination of the pore size distribution in a thermally sprayed ceramic coating. Only isometric porosity was evaluated

### Delivery

Materials analyses can normally be delivered within 1 – 3 working days

Sulzer Markets and Technology Ltd  
**Sulzer Innotec**  
 P.O. Box  
 CH-8401 Winterthur, Switzerland  
 Phone +41 (0) 52 262 21 21 Fax +41 (0) 52 262 00 15  
 E-mail swa.innotec@sulzer.com  
 Internet:www.sulzerinnotec.com



Akkreditiert  
 Nr: STS 013