

## MATERIAL PROPERTIES TESTS

### Capabilities:

- Testing of materials structure,
- Testing of materials surface including chemical composition analysis,
- Fractography tests,
- Material properties measurements.

### Fractography - SEM

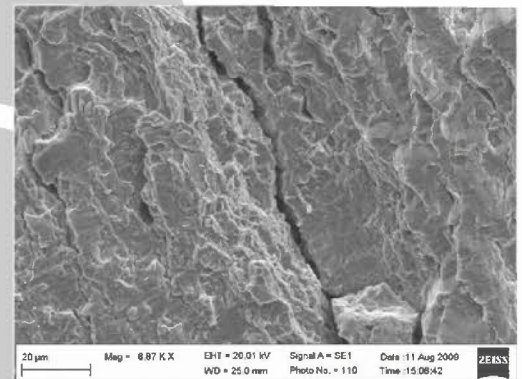
- Testing of metallic and non-metallic specimens,
- Very high resolution images of a sample surface.

#### Scope:

- **Material tests:** surface observations using SE and BSE detectors, determination of the coating thickness,
- **Microscope fracture examinations:** detection of contaminants, microcracks, crack sources, quantitative examinations of the structure of fractures and determination of material homogeneity.

#### Equipment:

Scanning Electron Microscope Zeiss EVO 25 MA with BSE and SE detectors.



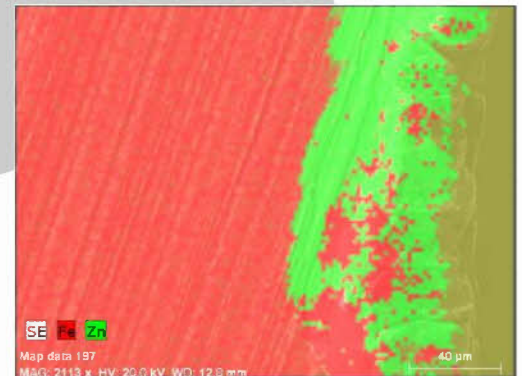
### Chemical composition analysis – EDX

#### Scope:

- Chemical composition analysis of specimens,
- Material identification,
- Identification of contaminants,
- Determination of the relative element concentration on the specimen's surface.

#### Equipment:

EDX detector: XFlash 5010 Bruker, Energy resolution 125 eV.



### Metallography:

#### Scope:

- Metallographic qualitative and quantitative tests, such as grain size evaluation, non-metallic inclusion size, phase volume fraction, coating thickness.

### Metallographic specimens preparation

#### Equipment:

- Cutting machine with the functions of manual and automatic cutting, cooled by water,
- Mounting press for specimens with max diameter  $\phi$  40 mm,
- Grinding- polishing machine capable of preparing up to 6 samples at a time.

### Microstructure analysis

#### Equipment:

- Metallographic microscope Neophot 2, magnification range 50x – 2000x.

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### Surface roughness tests

Equipment:

Surface roughness tester Mitutoyo Surftest SJ-301

- Drive unit: X-axis: measuring range: 12.5mm,
- Measuring speed: 0.25, 0.5 mm/s,
- Detector: range: 350 $\mu$ m,
- Detecting method: tactile measurement,
- Measuring force: 0.75mN,
- Stylus tip: diamond (60° / 2 $\mu$ mR),
- Evaluation parameters: Ra, Ry, Rz, etc.

### Toughness tests

Equipment:

Portable Hardness Tester Mitutoyo

- Measurement in Leeb DL scale, possibility to convert to HV, HB, HRC, HRB scales,
- Maximum surface roughness of the sample Ra 10 $\mu$ m, thickness greater than 5 mm.

Innovatest Hardness Tester

- Vickers Hardness Tester
- Load range:
  - 0.02 – 0.1 Kgf microhardness Vickers,
  - 0.2 – 5 Kgf Vickers hardness at low loading,
  - 10 – 30 Kgf Vickers hardness.

### Impact tests

- Tests can be conducted at elevated temperatures in the range of -196°C ÷ 40°C
- Charpy impact tests can be performed on standard 10x10x55mm as well as reduced specimens 7.5x10x55mm and 5x10x55mm

We are able to prepare specimens for tests in the Machining Workshop (according to ASTM standards or other requested by the client).

Equipment:

Pendulum Charpy Impact Tester

- Complies with PN-EN ISO148-1, PN-EN 10045 and ASTM E23 standards,
- NIST verification of the current ASTM E23 standard,
- Pendulum energy 300J.

