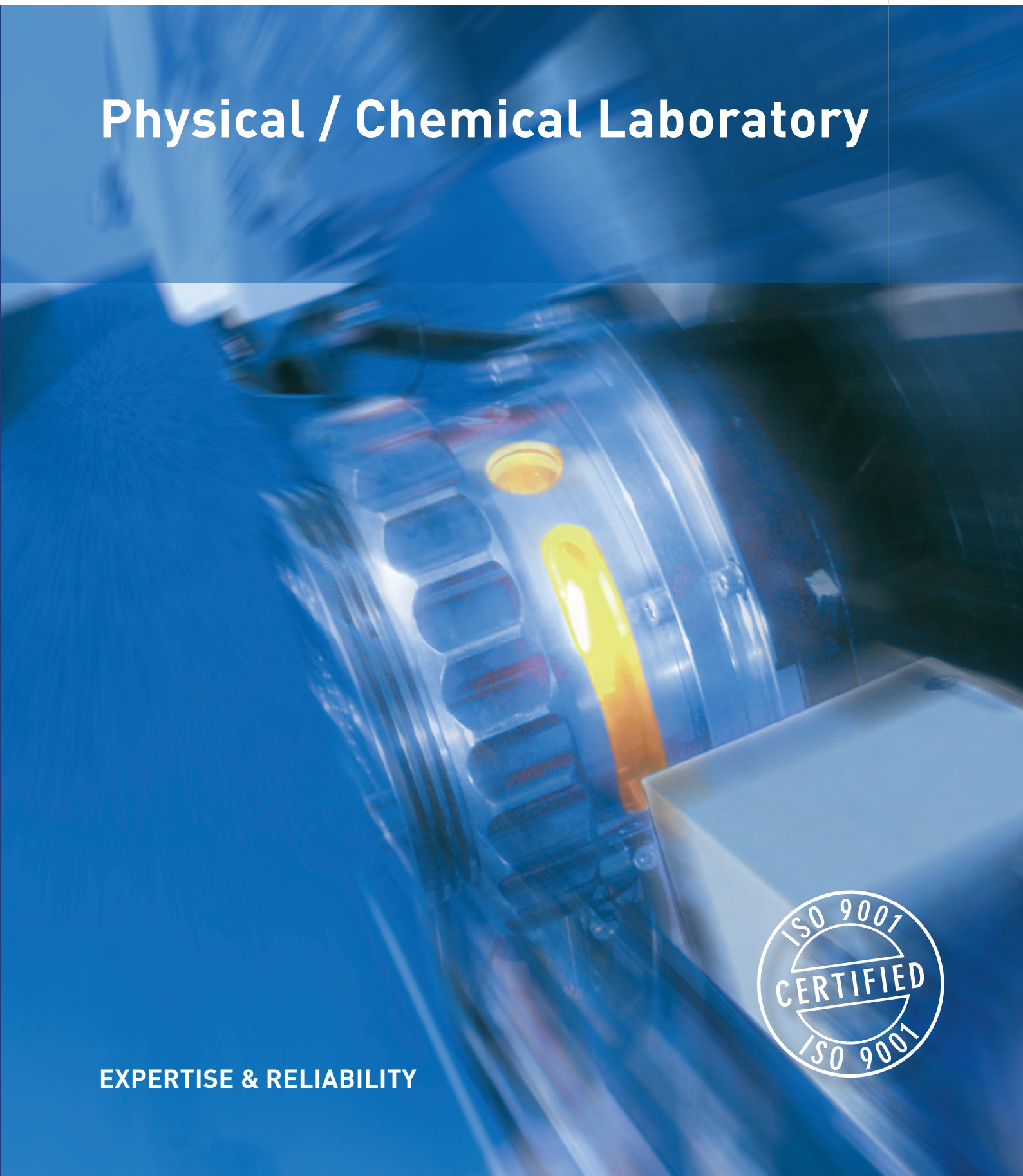
MATERIALS CENTER LEOBEN
FORSCHUNG GMBH

Physical / Chemical Laboratory



EXPERTISE & RELIABILITY

Physical / Chemical Laboratory

Our expertise is your benefit

The Materials Center Leoben offers a sound mix of theoretical and practical expertise and state-of-the-art facilities, making it a flexible and experienced partner for demanding research, development and application tasks in the areas of materials engineering, process engineering, quality assurance and component design.

The physical / chemical laboratory specialises in the characterisation of materials in terms of the following properties:

- Crystallographic structure
- Phase composition
- Residual stress
- Surface topography
- Chemical composition

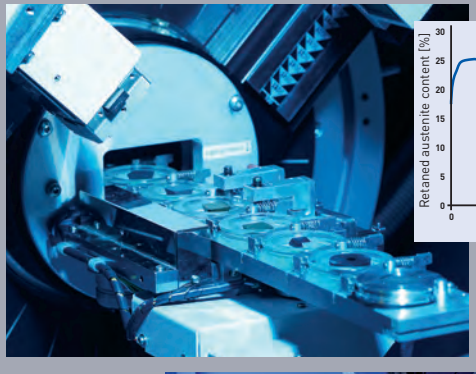
The physical / chemical laboratory of the Materials Center Leoben offers both standard methods – such as determination of retained austenite and residual stress measurement – and highly specialised methods for innovative solutions in materials research and process development.

EXPERTISE AND HIGH-TECH EQUIPMENT

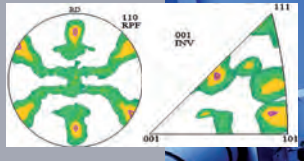
FOR YOUR SUCCESS

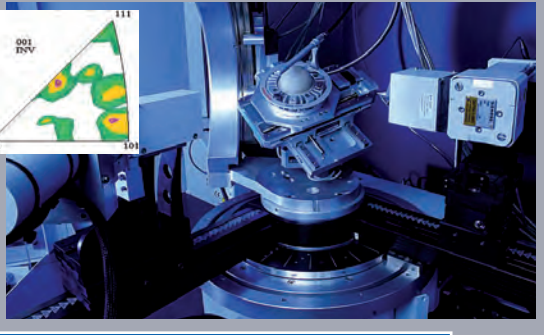
Qualitative and quantitative phase analysis

Determination of phase structure and structural parameters at room temperature, elevated temperatures and different atmospheres using state-of-the-art X-ray analysis and advanced evaluation methods.



Retained austenite depth profile in a case hardened component





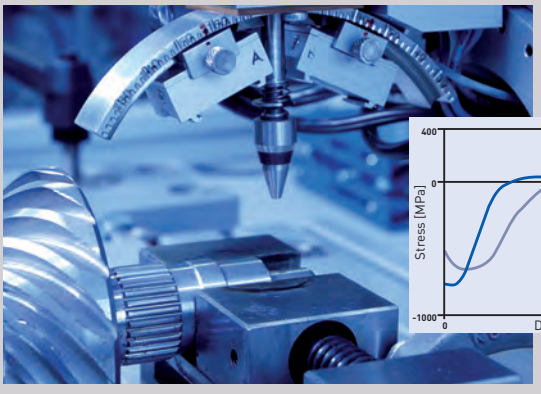
Measurement of pole figures of an electrical sheet

Our fields of expertise

- Examination of steels, especially high-alloy, multiphase stainless steels
- Expertise in carbide / nitride and oxide hard coatings and ceramic materials
- Determination of phase fractions in multi-phase materials using powerful analysis methods (e.g. Rietveld analysis)
- Measurement of fibre textures in coating systems
- Determination of crystallographic structure parameters as a function of temperature

Residual stress measurement

X-ray analysis of residual stresses in surface layers of components, specimens and coatings.



Residual stress depth profiles of two surface layers

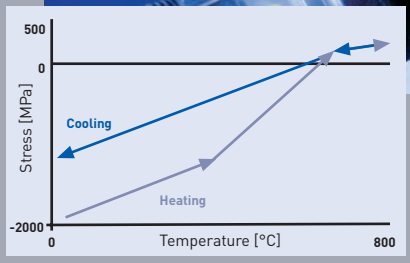
Our fields of expertise

- Determination of residual stresses, residual stress distributions and depth profiles of components in the lab or at customer's site
- Residual stress development in coating / substrate compounds during temperature cycling
- Relaxation of residual stresses at elevated temperatures

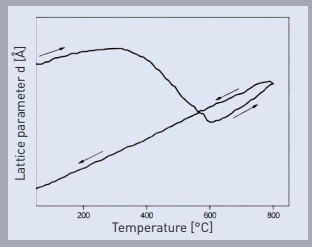
On-site residual stress measurements on components

High-temperature properties and phase transformations

Determination of phases, phase transformations, structure parameters and residual stresses at elevated temperatures and different atmospheres.



Residual stress profile in a CrN hard coating on steel during thermal cycling



Temperature-dependent lattice parameter of a coating

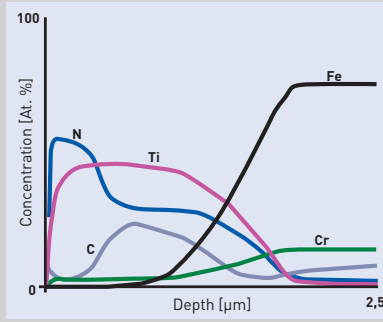
Our fields of expertise

- Determination of phase transformations such as magnetic transformations and lattice transformations, melt or glass transition temperatures
- Monitoring of phase changes caused by annealing processes
- Determination of temperature-dependent structure parameters
- Detection of phase reactions (e.g. oxidation, decomposition) with simultaneous measurement of volatile components
- Determination of heat capacity

Chemical analysis

Chemical using of materials analysis with optical emission spectrometry* and X-ray fluorescence analysis and determination of chemical depth profiles of modified surface layers and coated surfaces.

On-site X-ray fluorescence analysis



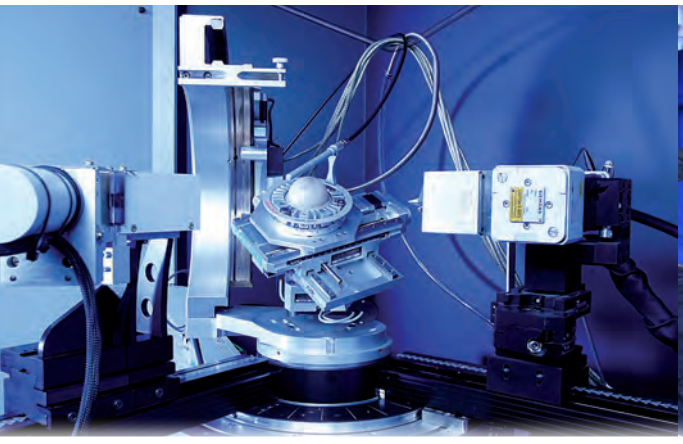
Chemical depth profile in a multilayer hard coating

Our fields of expertise

- Chemical analysis using optical emission spectrometry* and X-ray fluorescence analysis in the lab and on site
- Determination of carbon and nitrogen depth profiles in carburised and nitrided steel surfaces
- Chemical depth profile analysis of hard coated surfaces, especially multilayer coatings and gradient coatings

* in cooperation with our scientific partners

RANGE OF SERVICES
AND EQUIPMENT



Our range of services

- **Qualitative and quantitative X-ray phase analysis** (25 to 1400°C)
- **Determination of retained austenite** by X-ray analysis (according to ASTM E 975-03 or using the Rietveld method, including depth profiles)
- **X-ray phase and structure analysis** of thin surface films
- Determination of **fibre textures** in coating systems (25 to 900°C)
- **Determination of process-induced residual stresses on surfaces by X-ray analysis** (25 to 900°C)
- Determination of **depth profiles of residual stresses** on specimens and components (e.g. gear components) by X-ray analysis
- Mobile **on-site residual stresss measurement** on large components or materials
- **Determination of phase transformation temperatures** and enthalpies with simultaneous mass and element analysis for determining oxidation and decomposition processes (up to 1400°C) in vacuum, inert (Ar, N_2) or oxidic atmospheres
- Measurement of **time-temperature transformation and precipitation diagrams** (isothermal and continuous, TTT, TTP)
- **Chemical analysis of materials** by optical emission spectrometry* and X-ray fluorescence analysis
- Measurement of **carbon and nitrogen depth profiles** on thermochemically treated steels
- Chemical **depth profile analysis of thin films** (e.g. nitride / carbide / oxide films)

*** in cooperation with our scientific partners**

Our equipment

- X-ray diffractometer Bruker D8 Advance for phase analysis with HTK 2000 high-temperature chamber for the detection of fast phase transformations in inert and oxide atmospheres (25 to 1600°C)
- X-ray diffractometer Bruker D8 Discover for residual stress and texture analysis with Paar DHS 900 hot stage (up to 900°C)
- Mobile X-ray diffractometers Stresstech XStress 3000 (G2/G3) with integrated depth measurement and automatic testing table, also suitable for measuring residual surfaces and in-situ measurements on test equipment
- High-resolution glow discharge spectrometer (GDOES) from HORIBA JOBIN YVON (HR profiler)
- Netzsch differential scanning calorimeter DSC/DTA STA-409C (up to 1400°C) for measurements in vacuum, inert (Ar, N_2) or oxide atmospheres
- Quenching dilatometer DIL805L from Bähr with inductive heating system (25 to1300°C) and integrated gas cooling system (N_2, He)
- Handheld X-ray fluorescence analyser S1TurboLE from Bruker

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