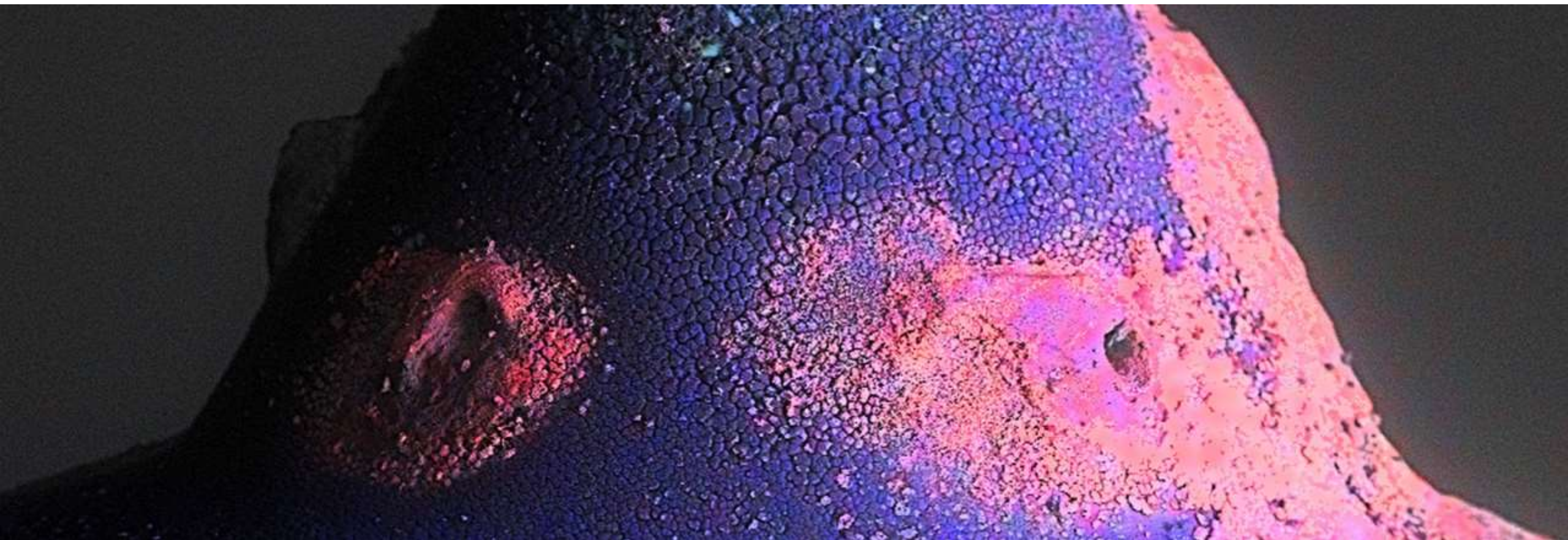




GWP Gesellschaft für Werkstoffprüfung mbH



GWP GESELLSCHAFT FÜR WERKSTOFFPRÜFUNG MBH

LABORATORY AND EXPERT SERVICES

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Stand 2020/08

LABORATORY

- Analytics
- Metallography
- Microscopy
- Computer tomography
- Materials Testing
- Environmental simulation
- Fire laboratory
- Airbag laboratory
- ParticleCheck
- Plastics laboratory
- Non-destructive materials testing



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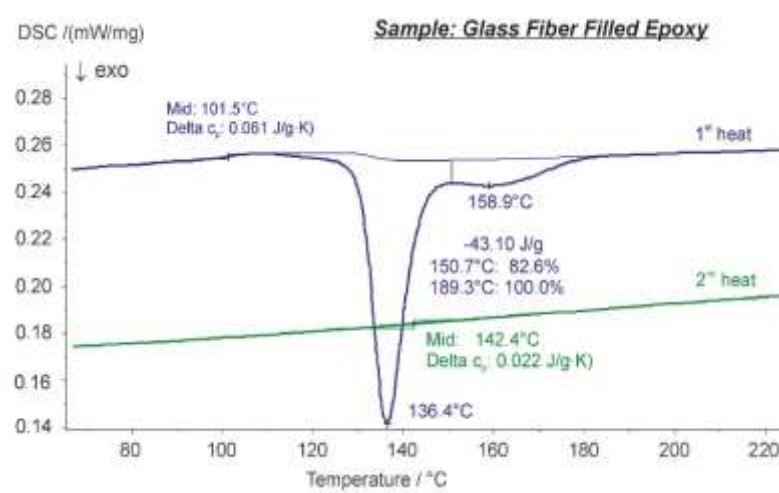
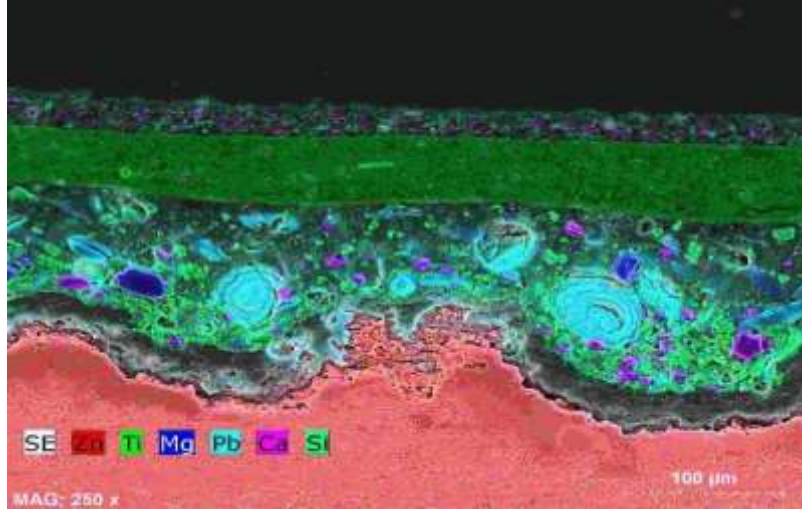


EXPERTS

- Damage analysis
- Research and development
- Product and component testing
- Advice on materials and production processes
- Process consulting
- Training / Seminars

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ANALYTIC

- Metals and alloys
- Polymers and composites
- Solid materials and surfaces

SERVICES

- Analyses of the chemical composition of metals and alloys*
- Element analyses in the trace range
- Determination of H,O,N in metals and other inorganic substances
- Analysis and characterization of polymers*
- Determination of the water content of solid or liquid samples
- Determination of the composition of surfaces
- Identification and quantification of crystalline phases
- Analyses of dusts, fibres & particles

METHODS

- Spark Spectral Analyses
- Energy dispersive X-ray micro-area analyses
- Dynamic differential calorimetry
- Thermogravimetric analysis (TGA)
- FTIR spectroscopy
- Karl Fischer Titration

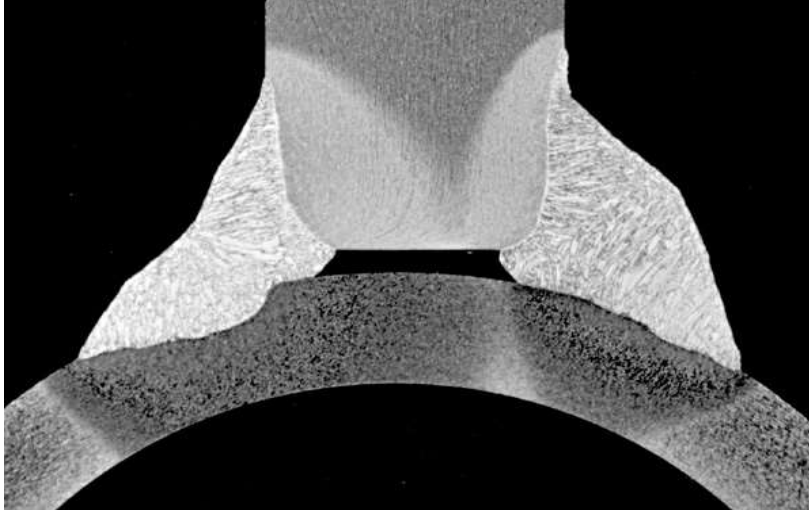


*Services in the accredited area. For details see attachment of the certificate

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METALLOGRAPHIC INVESTIGATIONS

- Microstructure investigations
- Standard tests
- Materialography on electronic components
- Damage analysis

SERVICES

- Sampling
- Automated preparation
- Target Preparation
- Microstructure analysis for heat treatment and production
- Investigations of brazing and welded joints
- Grain size determination*
- Coating thickness measurement*
- Determination of the degree of purity
- On-site metallography

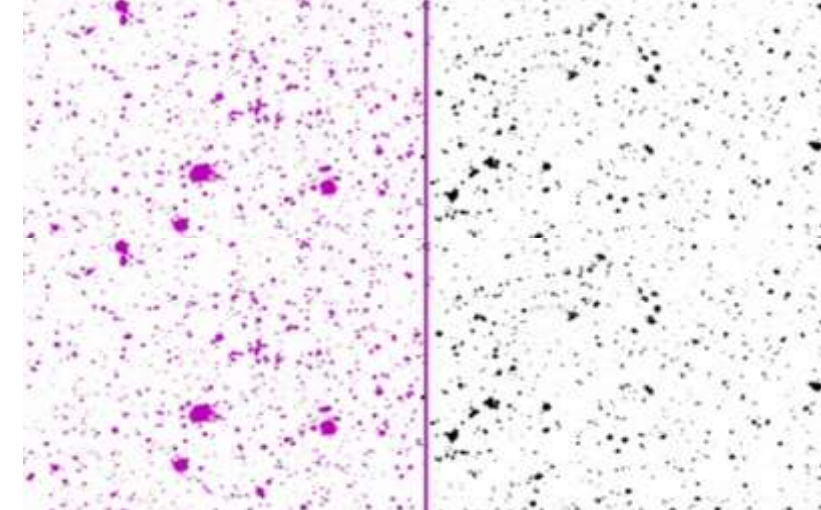
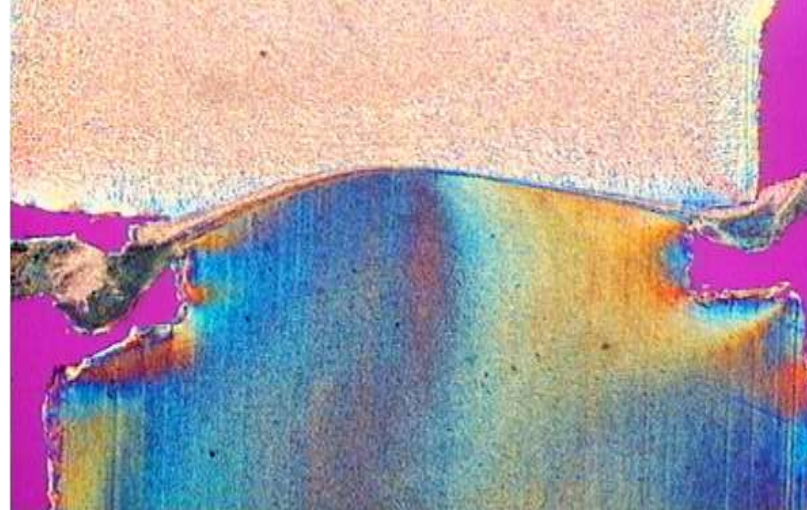
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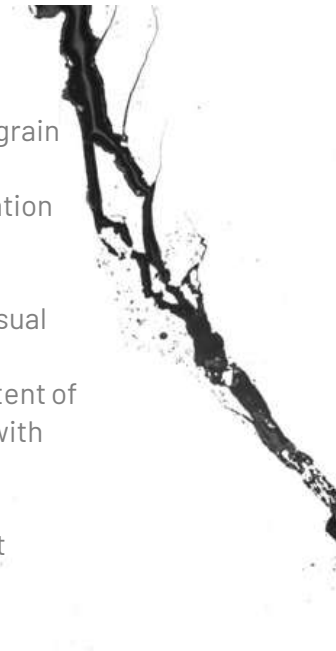
MAKROSCOPY

EMICROSCOPICAL INSPECTIONS

IMAGE ANALYSIS

- Professional images of components, samples or damaged areas.
- Documentation upon receipt of samples, marking of sample locations or first assessments of damage
- Macroscopic fracture examinations

- Incident and transmitted light microscopy
- Metallographic evaluations
- Determination of the identifiable grain size*
- Determination of the decarburization depth*
- Microstructure determination*
- Graphite classification through visual evaluation*
- Metallographic testing of the content of non-metallic inclusions in steels with image series
- Up to 1000x magnification
- bright field and dark field contrast
- Differential Interference)



- Semi- and fully automatic image analysis
- automatic coating thickness measurement
- Phase evaluation
- Pore evaluation
- Measurements

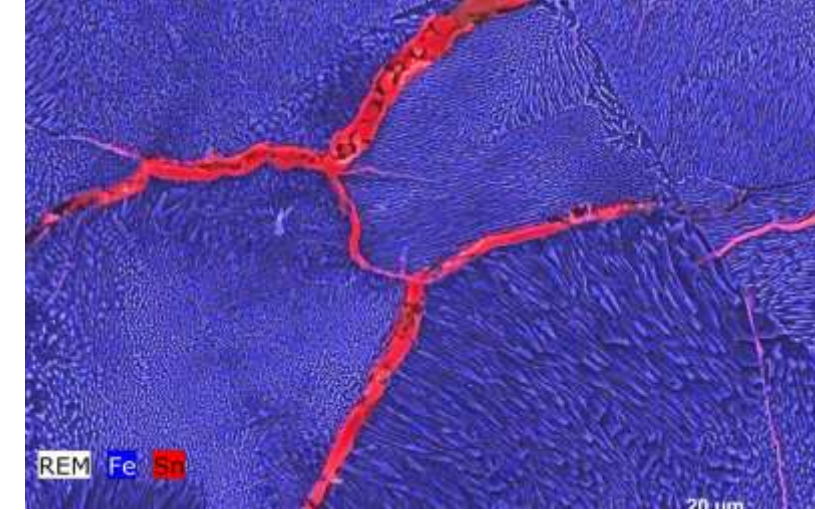
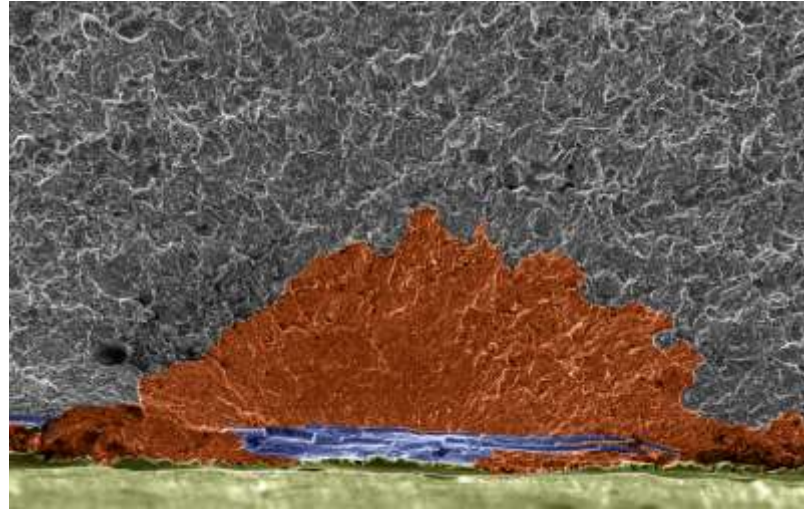
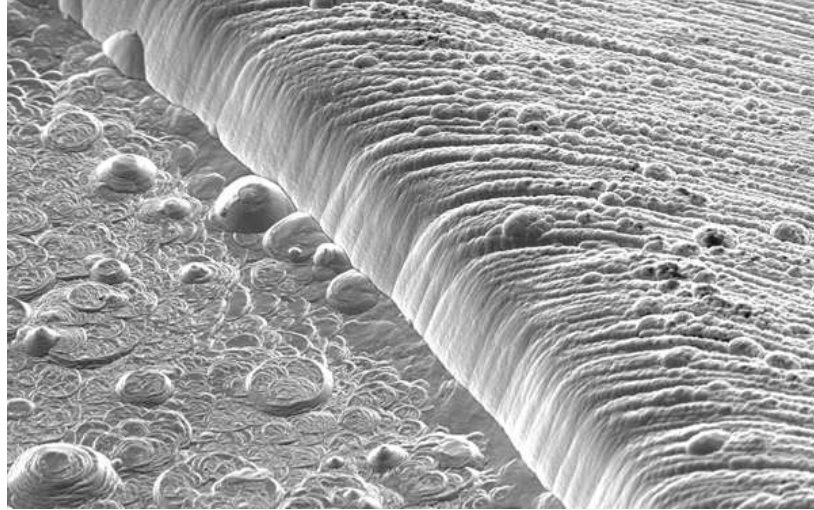


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Your contact person

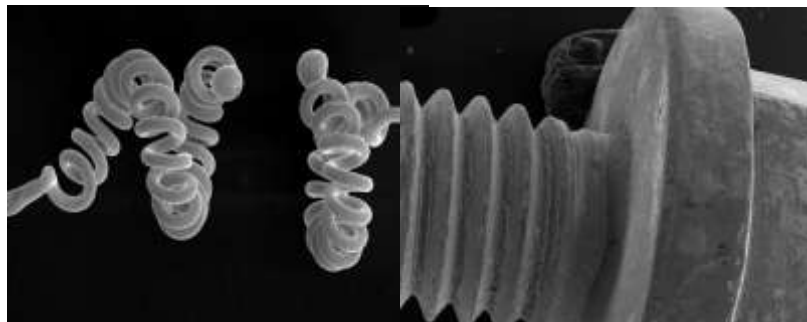
Florian Kronpass
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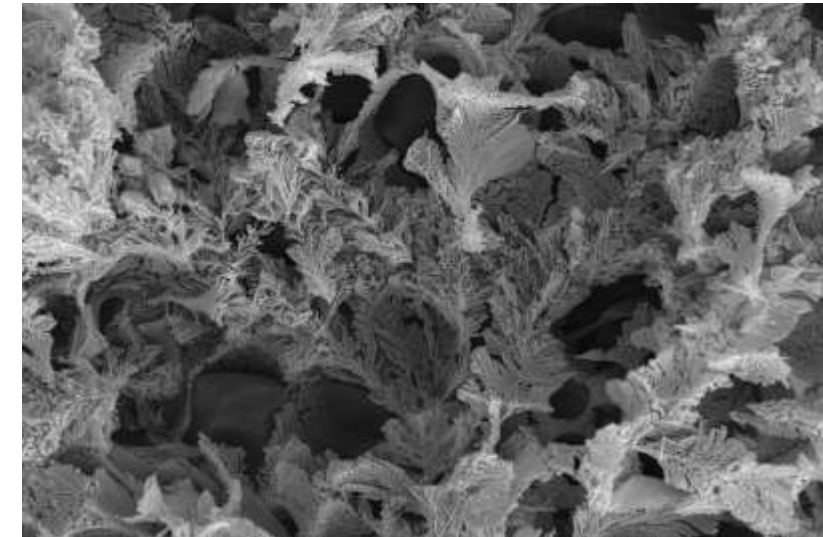
SCANNING ELECTRON MICROSCOPY

- Damage analyses
- Microscopic fracture examinations
- Characterization of surface defects
- Corrosion investigations



SERVICES

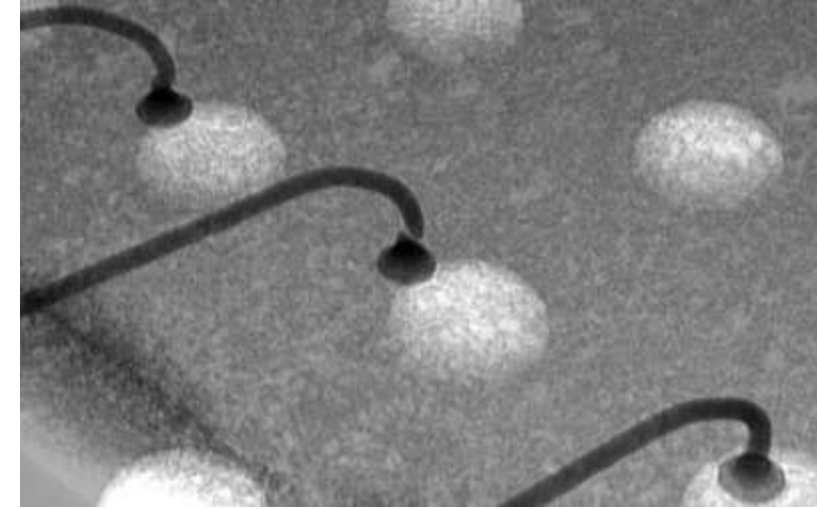
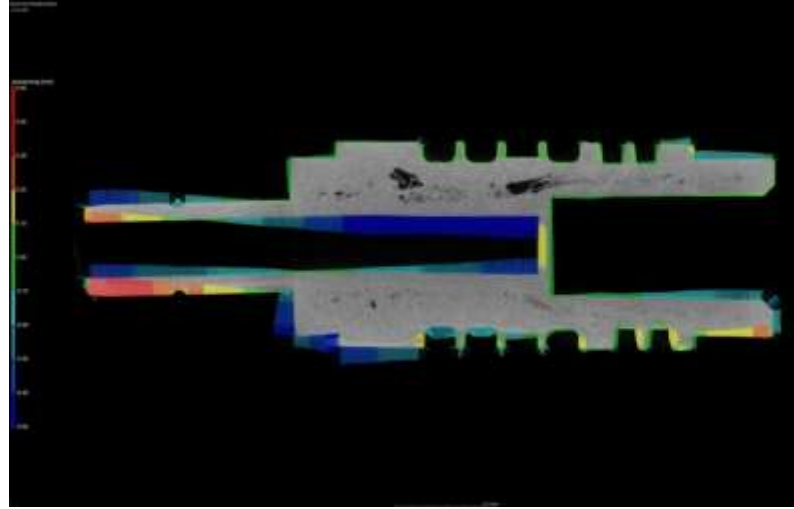
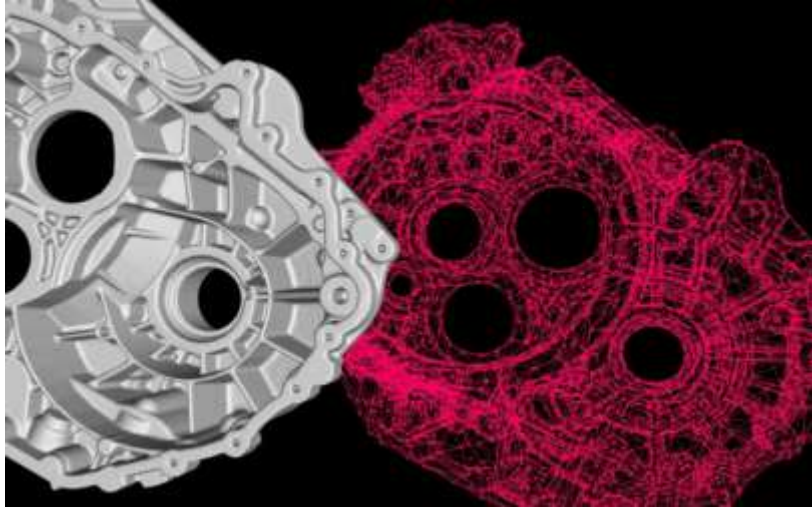
- Fractographic investigations
- Evaluation of the microscopic fracture characteristics
- Evaluation and documentation of surface damage
- Examination of electronic components
- Characterization of fibers, particles and dusts
- Imaging by secondary or backscattered electron contrast
- Resolution in the 2-digit nm range (50,000 times)
- Operation with low vacuum (1 to 270 Pa) possible (no evaporation of the sample necessary)
- EDX element analysis with silicon drift detector
- EDX Linescan and element distribution images (mapping)
- Large sample chamber: samples with diameters up to 200 mm, 70 mm height and up to 2 kg.



Your contact person

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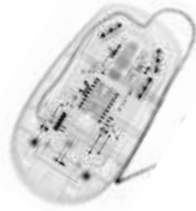


INDUSTRIAL COMPUTER TOMOGRAPHY

SERVICES

WISSEN SCHAFFT FORTSCHRITT®

- Automotive
- Foundry industry
- Electrical Engineering
- Research & Development



- μ -focus and nano-focus
- Detail recognition down to 5 μ m
- Representation of the test specimen as 3D volume
- Coordinate Measuring Technology
- geometric dimensioning
- Target-performance comparison, comparison with CAD,
- Wall Thickness Analysis
- Defect Analysis
- Determination of volume and porosity
- Segmentation of complex multi-material constructions
- Automated evaluation procedures for series testing
- Visualization and animation according to customer-specific requirements



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MECHANICAL MATERIALS TESTING

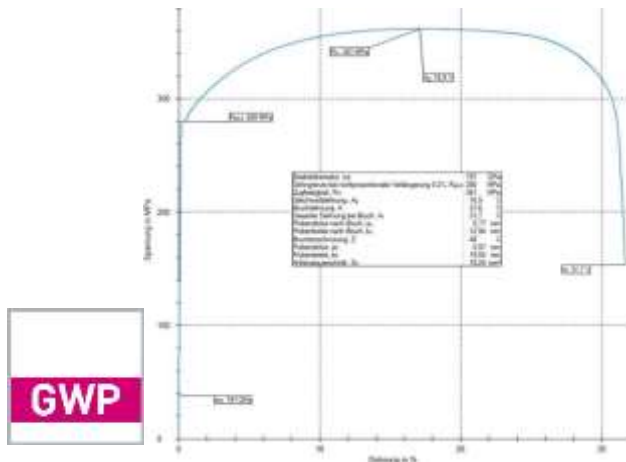
- Testing the mechanical properties of metals, plastics, elastomers, bondings, screw connections, weld seams, textiles
- Component tests
- Customer-specific tests

SERVICES

- Tensile tests*
- 1. 2 and 4 point bending tests*
- Plate bending test
- Pressure tests
- Notched bar impact tests*
- Roller peel tests
- Bake-hardening index
- Shear tests
- Creep rupture tests

STANDARDS

- DIN EN 10002-1, EN ISO 6892-1, ISO 6892, ASTM E 8, ASTM E 21, DIN 50154; DIN 50125, DIN EN 12311 , DIN EN 12310-1 , DIN EN 1707, DIN EN 10325 DIN EN ISO 7438, VDA 238-100, DIN EN ISO 5173 DIN EN ISO 178, DIN EN ISO 14125 SAE/USCAR-7-1 DIN EN ISO 148-1: 2011-01; DIN EN ISO 9016 DIN EN ISO 179-1/2

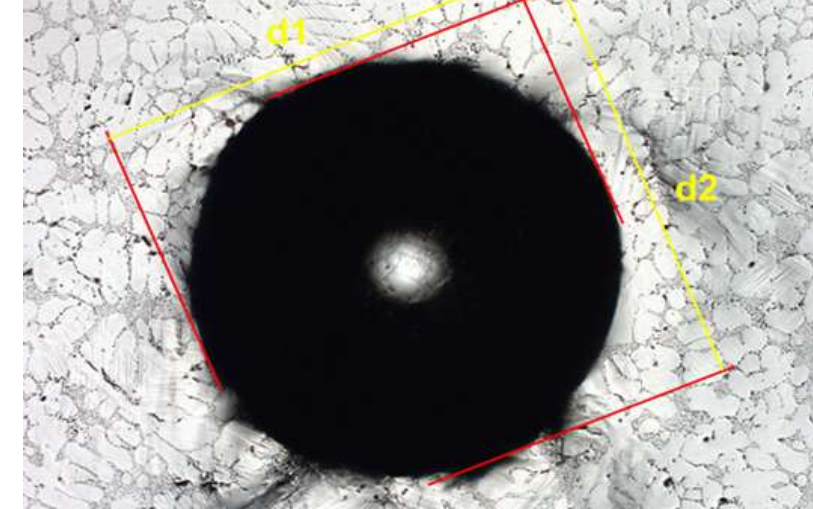
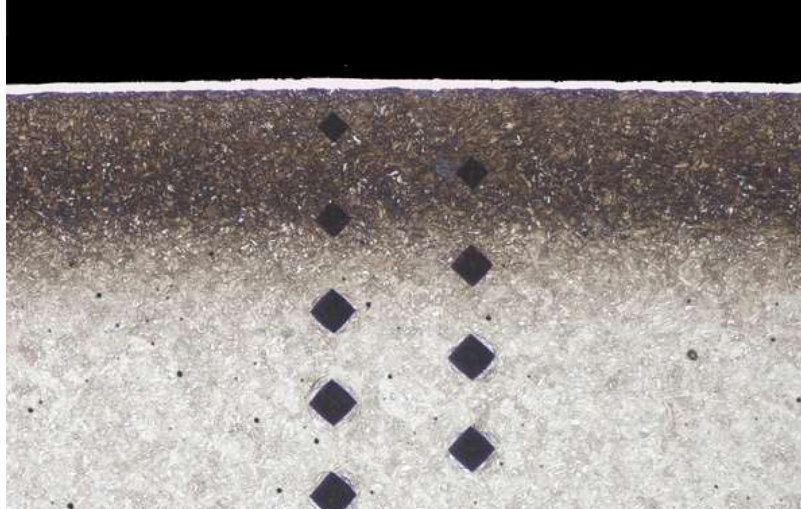
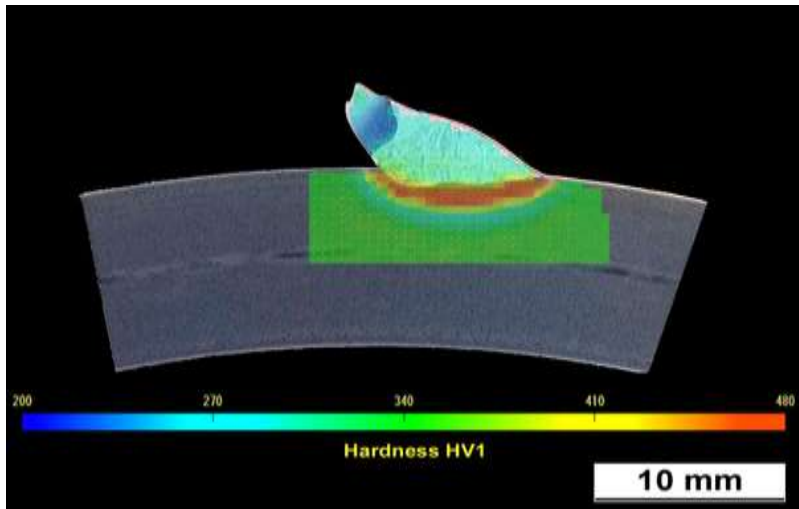


*Services in the accredited area. For details see attachment of the certificate

Your contact person

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HARDNESS TESTS

- Vickers
- Brinell
- Rockwell
- Shore



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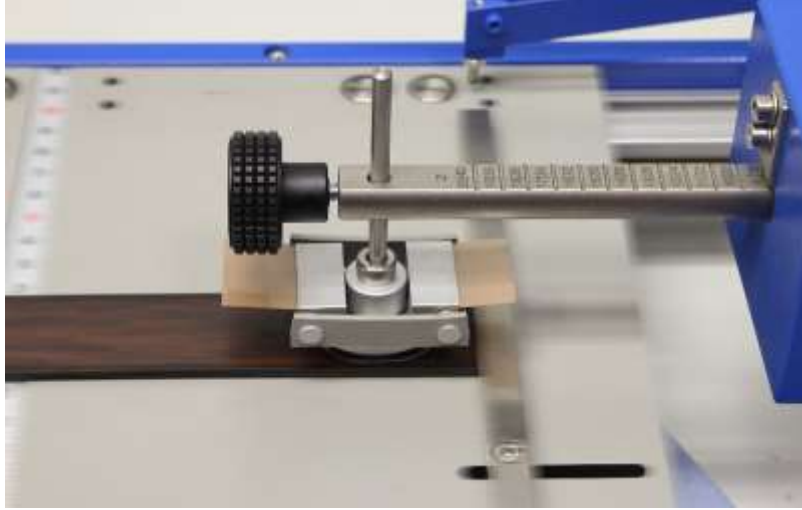
SERVICES

- Macro hardness measurement according to Vickers, Brinell and Rockwell*.
- Micro hardness measurement*
- Case hardening depth CHD according to DIN EN ISO 2639
- Hardening depth DS according to DIN EN 10328**
- Nitriding depth Nht according to DIN 50190-3*
- Decarburization depth according to DIN EN ISO 3887*
- general hardness curves
- Hardness mapping 2D hardness curve for the identification of local hardness differences on large sample cross sections, e.g. impermissible hardening of welds
- Plastic hardness testing
- Mobile hardness tests

Your contact person

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MECHANICAL SURFACE TESTING

SERVICES

STANDARDS

- Plastics
- Coatings
- Paints
- Decorative trims

- Abrasion resistance - Colour fastness test*
- Abrasion resistance - Micro-scratch resistance*
- Scratch resistance*
- hot-scratch test
- Score hardness test according to Wolff-Wilborn
- Cross cut test*
- Multi-impact test
- Development of customer-specific tests

- DIN EN ISO 20567-1, FORD FLTM BI 157-06, RENAULT D24 1702, PSA D24 1312
- DIN EN ISO 105-X12, PV_3906_DE, TL 226, SES N 3243
- TL226, PV 3987, DIN EN ISO 12947-1
- AS/NZS 1580.403.1, PV 3952, TL 226, BS 3900-E2, DIN 53799, ECCA T12, EN 13523-12, ISO 1518-1
- HONDA 7710Z-TVA-9000 6-14
- ASTM D 3363, BS 3900-E19, ISO 15184, JIS K 5600-5-4, SES N3243
- DIN EN ISO 2409:2013-06:, ASTM D3359 - 02



*Services in the accredited area. For details see attachment of the certificate

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CLIMATE TESTING

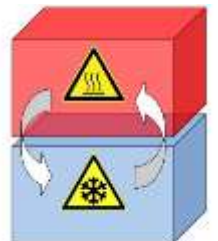
- Simulation of climatic and thermal conditions
- Search for weak points
- Lifetime estimation
- Functional test
- Tests automotive components
- Interior and trim parts
- Coated and painted components
- Testing of electronic and electromechanical components
- Qualification of packaging
- Durability testing of pyrotechnic articles

SERVICES

- Temperature shock test
- Test chamber: 300 l
- Test material: up to 50 kg
- Temperature heat chamber: +50 to +220 °C
- Temperature cold chamber: -80 to +70 °C
- Transfer time: < 10 s
- Climate change tests
- Test rooms up to 1000 l
- Suitable test chambers for pyrotechnics
- Temperature ranges: -40°C to +180°C-Humidity ranges: 0% RH to 97% RH
- Temperature change rate: ± 5 K/min

STANDARDS

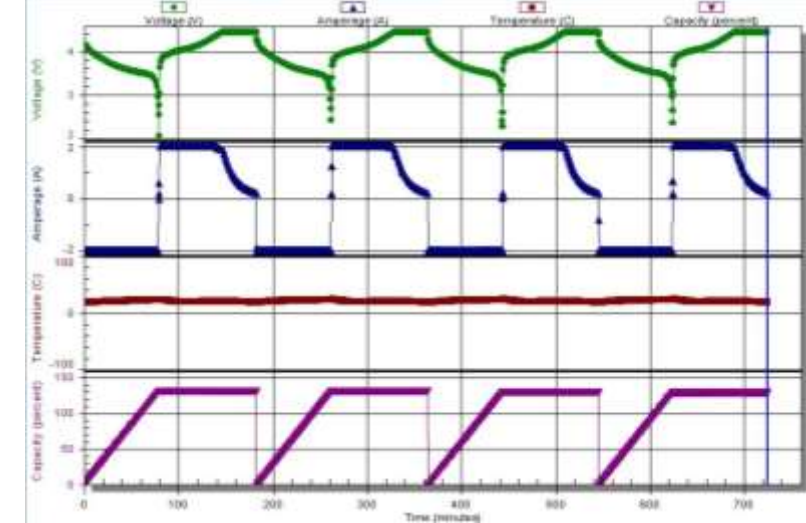
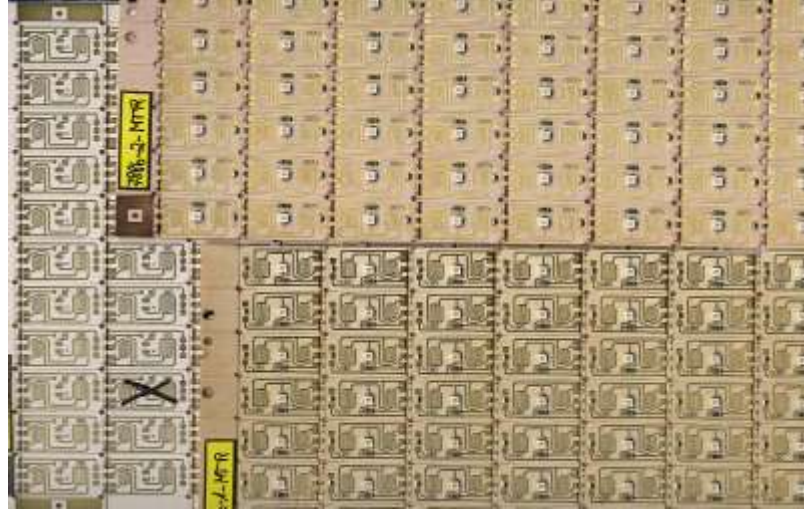
- DIN EN/IEC 60068-2-14, DIN EN ISO 2819, MIL 810, MIL 883
- DIN EN 60068-2-1,-DIN EN 60068-2-2, DIN EN 60068-2-14, DIN EN 60068-2-30, DIN EN 60068-2-7, DIN 17025, PV 1200 (VW-Norm), PK 303.4 (BMW-Norm)



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CLIMATE SIMULATION ELEKTRINIC

SERVICES

- Climate simulation of electrical and electronic components
- Search for weak points
- Lifetime estimation
- Functional test

- M-01 Free fall
- M-02 Rockfall test
- K-01 High temperature storage / Low temperature storage
- K-02 Step temperature test
- K-03 Low temperature operation
- K-04 Refinishing temperature
- K-05 Temperature shock (component)
- K-06 Salt spray test with operation, outdoor
- K-08 Humid heat, cyclic
- K-07 Salt spray test with operation, interior
- K-09 Damp heat, cyclic (with frost)
- K-14 a Humid heat constant - Severity 1
- K-14 b Humid heat constant - Severity 2
- K-15 b Climatic test for components with waterproof housings
- K-15 b Climatic test for components with waterproof housings

- Chemical tests
- P-01 Parameter test (function test)
- P-02 Parameter test (small)
- P-03 Parameter test (large)

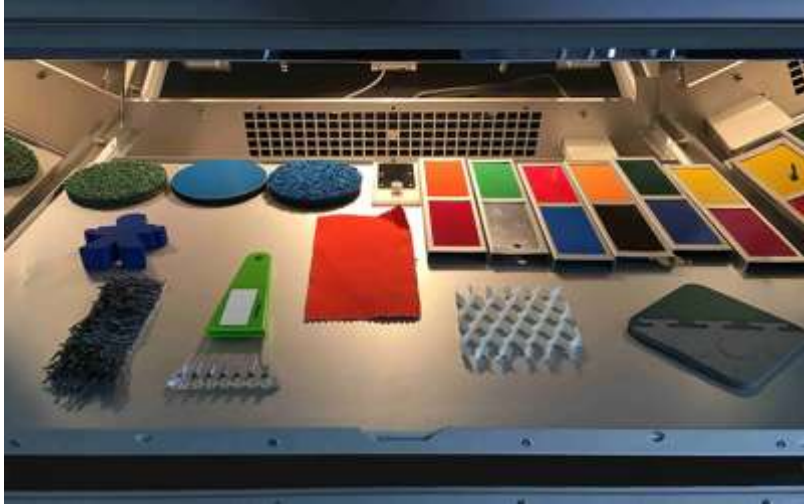
STANDARDS

- VW 80000: 2017-10
- Daimler/ Mercedes LV 124-2 & MBN 10306: 2020-06
- Scania TB1900: 2013-10
- BMW GS95024-3-1: 2019-08

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XENON TEST & SUN SIMULATION

Laboratory weathering to simulate damage caused by humidity, full spectrum sunlight and high temperatures

- Light fastness Plastics
- Lightfastness test automotive
- Lightfastness test textiles
- Weathering test on laminated safety glass
- Weathering test plastics



COLOUR AND GLOSS MEASUREMENTS

Colour and gloss measurements before and after weathering tests

- Determination of the colour difference
- Colour tone search
- Colour intensity determination
- Metamerism
- Evaluation of lightfastness on a grey scale
- Determination of the gloss



For details see attachment of the certificate



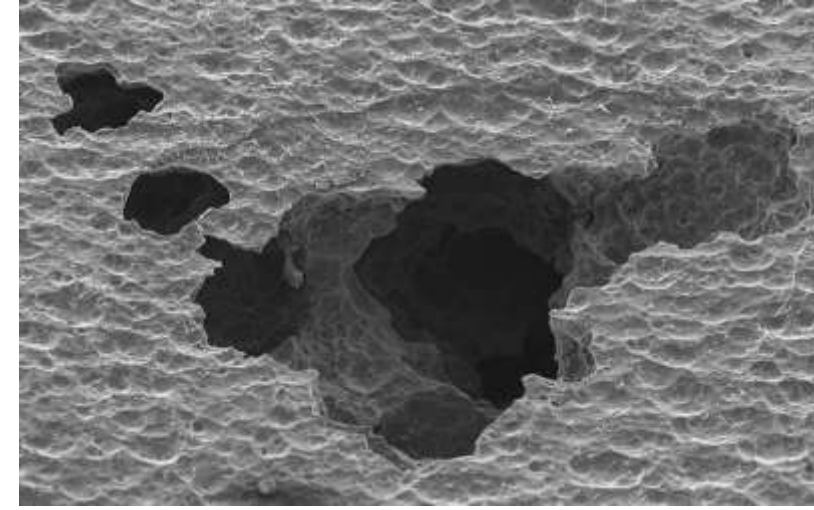
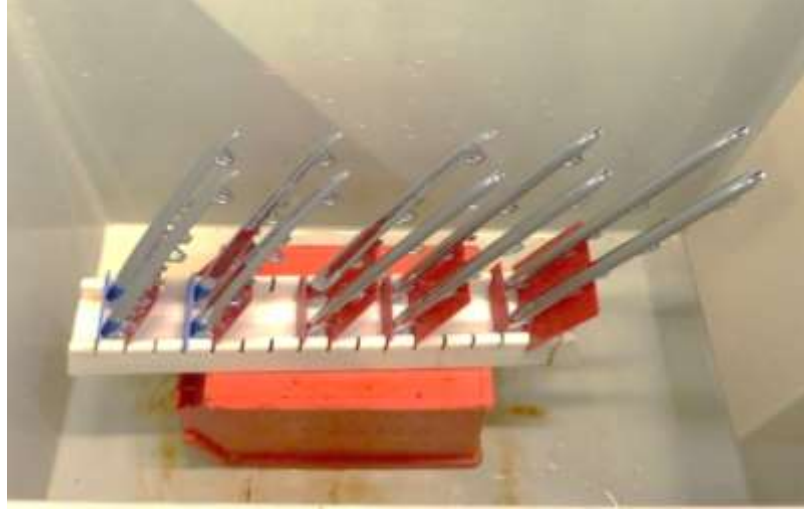
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SALT SPRAY TESTS

WISSEN SCHAFFT FORTSCHRITT®

SERVICES

- Salt spray test to evaluate the corrosion resistance of metallic components/materials with or without corrosion protection
- Evaluation of corrosion protection (coatings, paintwork, etc.)



- Salt spray test according to DIN EN ISO 9227 CASS copper accelerated acetic acid salt solution with pH between 3,0 and 3,1.
- For decorative coatings of copper-nickel-chrome or nickel-chrome and anodic coatings on aluminium.
- Salt spray according to DIN EN ISO 9227 NSS salt solution with neutral pH between 6.5 and 7.2. For metals and their alloys, cathodic or anodic metal coatings, conversion coatings, organic coatings on metals.

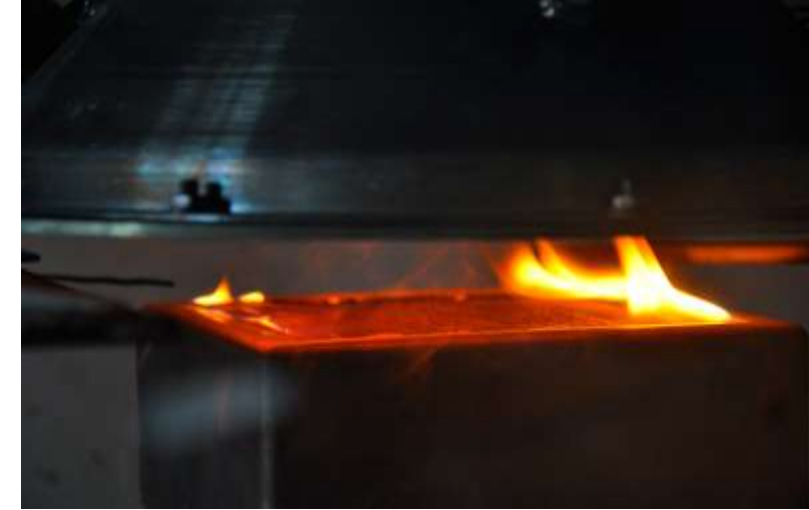
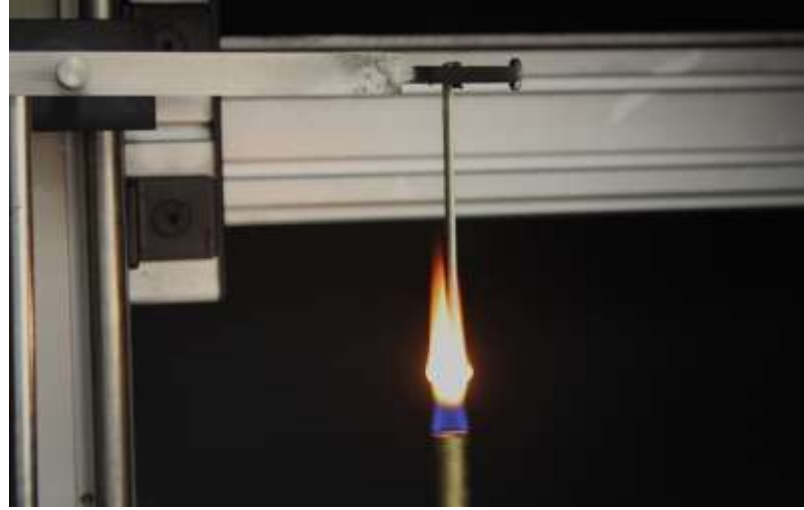


For details see attachment of the certificate

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FIRE TESTING

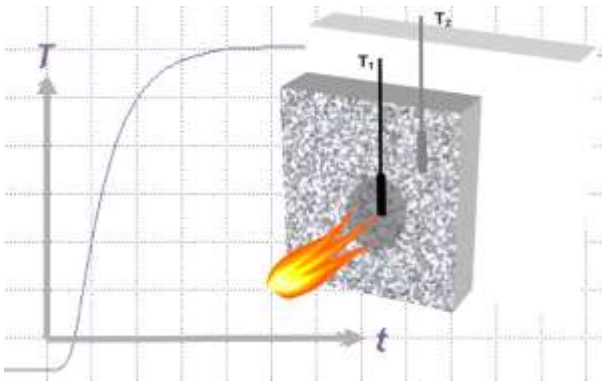
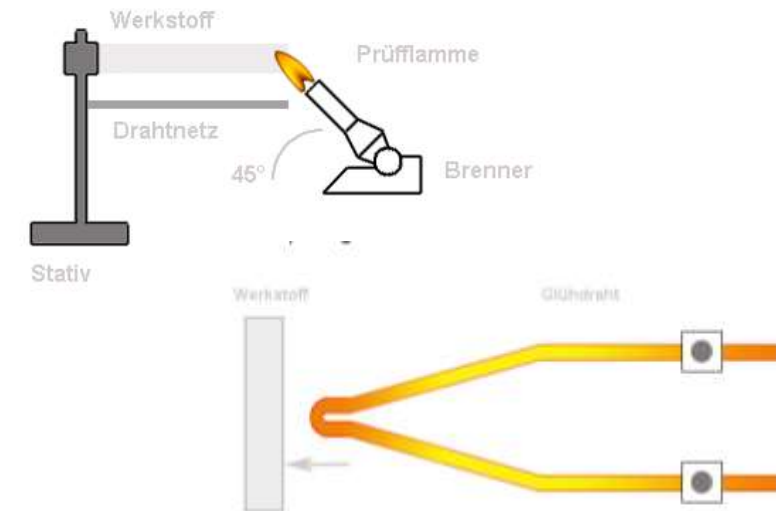
SERVICES

WISSEN SCHAFFT FORTSCHRITT®

Fire tests for the characterization of

- Flammability
- Fire behaviour
- Heat resistance

- Fire tests for automotive industry , Machines for agriculture and forestry
- Flammability and fire velocity according to DIN 75200, FMVSS 302.
- Fire classification test UL94 fire tests with 50 W test flame horizontal and vertical
- Fire test to determine the oxygen index(LOI)
- Fire test with glow wire
- Fire test to determine the heat release rate (MARHE)
- Fire test on batteries

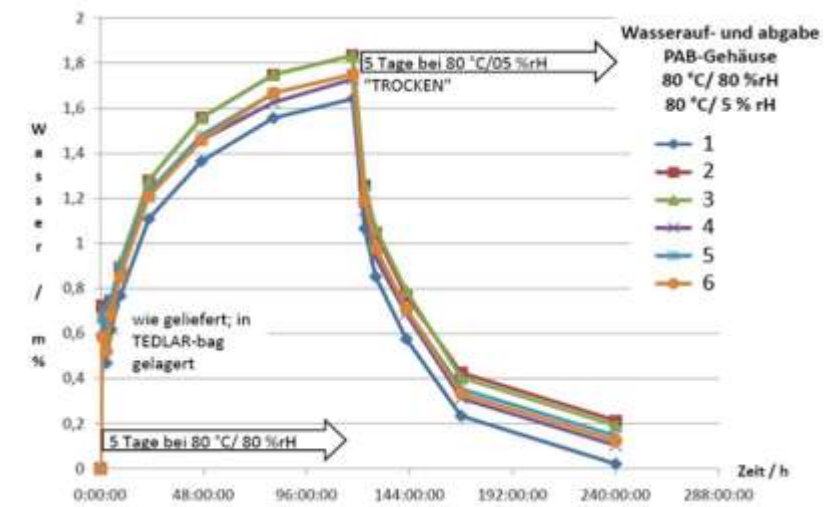


For details see attachment of the certificate

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PLASTIC LABORATORY

- Mechanical analyses
- Physical analyses
- Examination of stability
- Contamination and damage



SERVICES

- Analysis of the base material
- Determination of fillers and additives
- Determination of chain length and degree of cross-linking
- Mechanical analysis of plastics and bondings
- Determination of the compression set
- Thermal analyses
- Determination of the flow properties
- Investigation of moisture influences
- Environmental simulation on plastics
- Chemical resistance test
- Fatigue strength test
- Thermal resistance test
- Analysis of mechanical damage
- Investigation of contaminations



*Services in the accredited area. For details see attachment of the certificate

STANDARDS

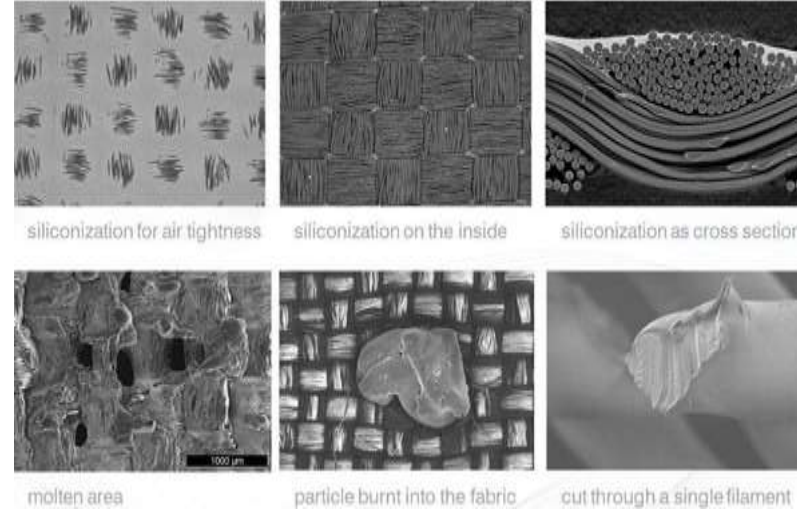
- FTIR
- Mikroskopie-FTIR
- Pyrolyse-GC/MS
- EDX
- GPC
- DSC*
- TGA*
- VICAT
- Fire tests
- Climate tests
- Sun simulation



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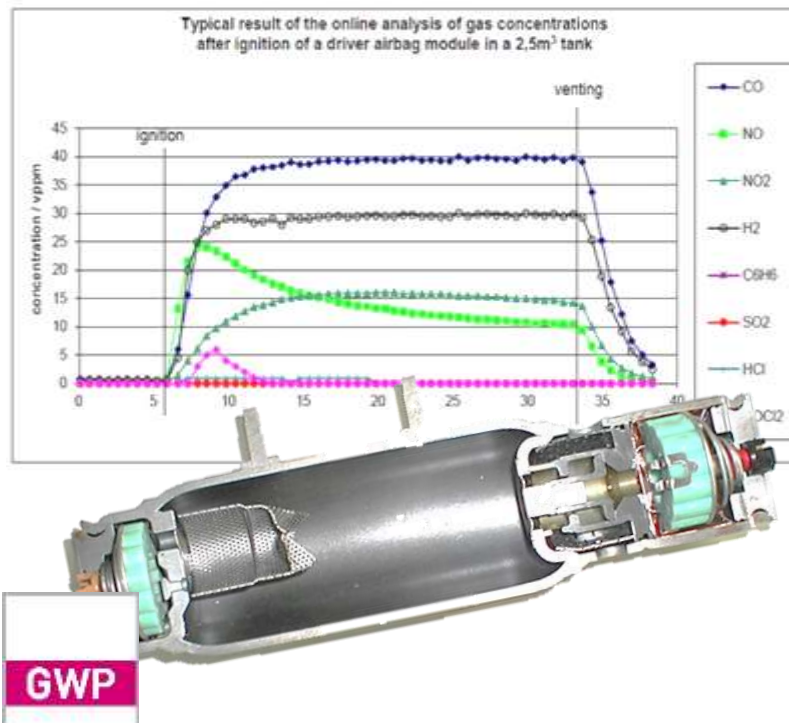




AIRBAG LABORATORY

SERVICES

WISSEN SCHAFFT FORTSCHRITT®



- Airbag emissions*
- Airbag gas analysis*
- Airbag dust analysis*
- Airbag performance of fuels
- Materialography on gas generators and igniters
- Materials engineering tests on airbag igniters
- Non-destructive examination of airbag modules
- Characterization of airbag fabric
- Investigations on airbag ignition wires
- Physical characterization of pyrotechnic propellants
- Environmental simulation on airbag modules

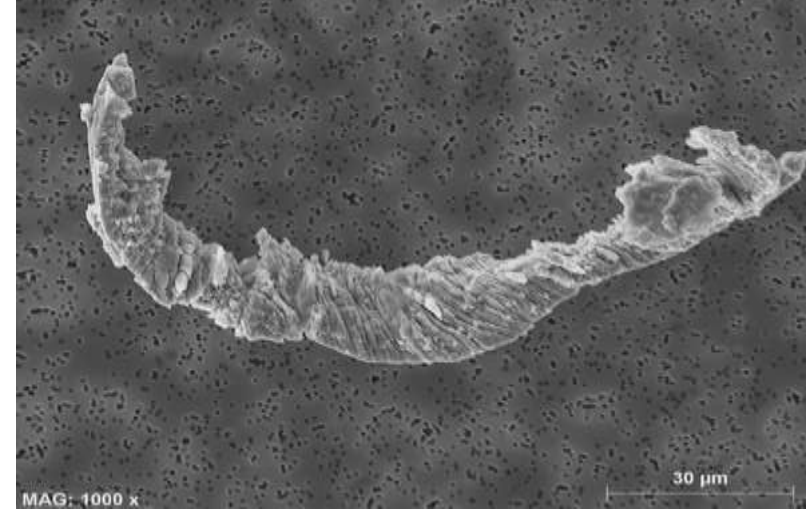
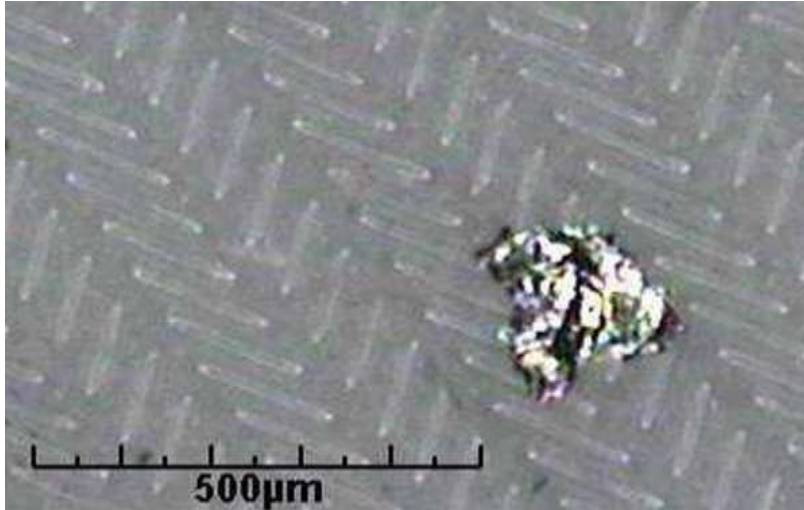
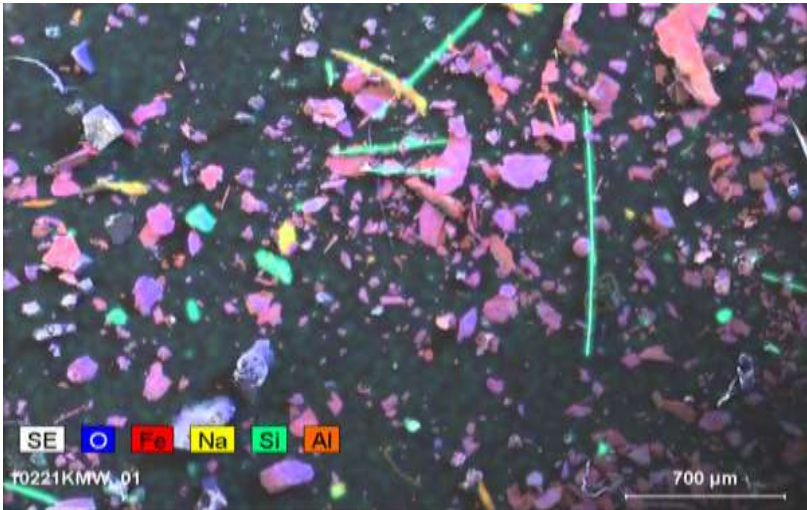


*Services in the accredited area. For details see attachment of the certificate

Your contact partner

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PARTICLECHECK

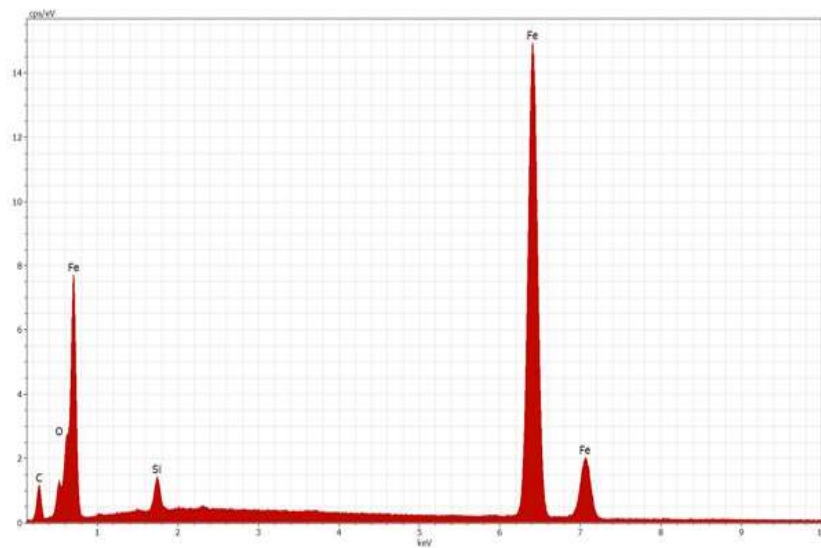
- Sample preparation
- Particle analysis
- Particle evaluation
- Technical cleanliness



SERVICES

- Extraction and analysis of particles in oils and greases (e.g. in hydraulic, motor, heat transfer oil, fuels and lubricating grease)
- Analysis of particles from filter systems and filter bags
- Coating, powder and dust analyses
- Tests for technical cleanliness according to VDA 19 (particle contamination of functionally relevant automotive parts) with material identification of the particles
- Analysis of undissolved drugs in injection solutions (parenteral)
- Analysis of fibers (asbestos, KMF, organic fibers, ...)

WISSEN SCHAFFT FORTSCHRITT®



Your contact partner

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MECHANICAL WORKSHOP

- sampling up to 1000 kg by sawing, cutting, milling
- Sample production of tensile and notched bar impact bending samples
- CNC-controlled sampling at engine blocks
- sawing, cutting, milling, turning
- Fixture and apparatus engineering
- Contract manufacturing



MACHINERY EQUIPMENT

- CNC turning machine
- turning diameter up to $\varnothing$ 520mm, turning length up to 850mm
- CNC milling machines
- X=1000mm, Y=560mm, Z=550mm
- workpiece weight up to 800Kg
- 24 tool places
- Siemens 828D control
- Saws
- Mössner record SM 300 (up to 160mm)
- Mössner record SSF 950 (up to 380mm)
- Forte 420 (up to 420mm)
- Mössner SSF 630 (up to 500mm)
- Further workshop equipment
- Wet cut-off machines
- Box column drills
- Sanding blocks
- Planer
- Presses
- welding equipment



WISSEN SCHAFFT FORTSCHRITT®



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NON-DESTRUCTIVE MATERIAL TESTING

- Penetrant testing
- Magnetic particle testing
- Eddy current testing
- Ultrasonic testing
- THz spectroscopy



Your contact person

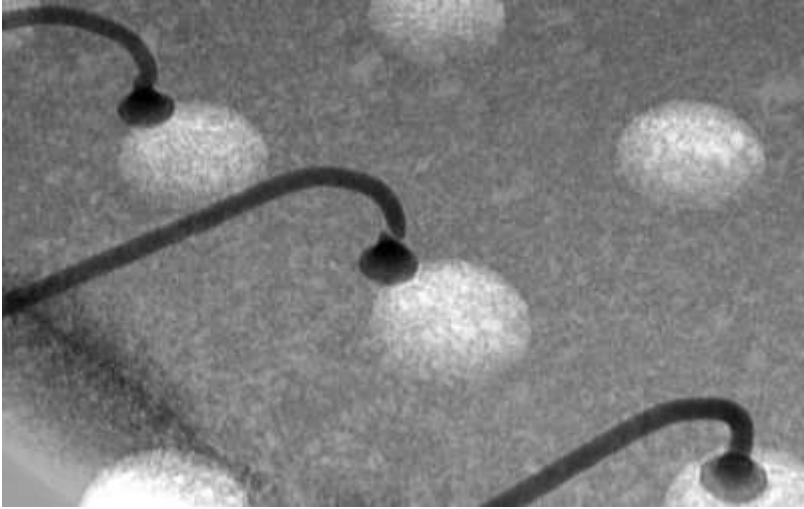
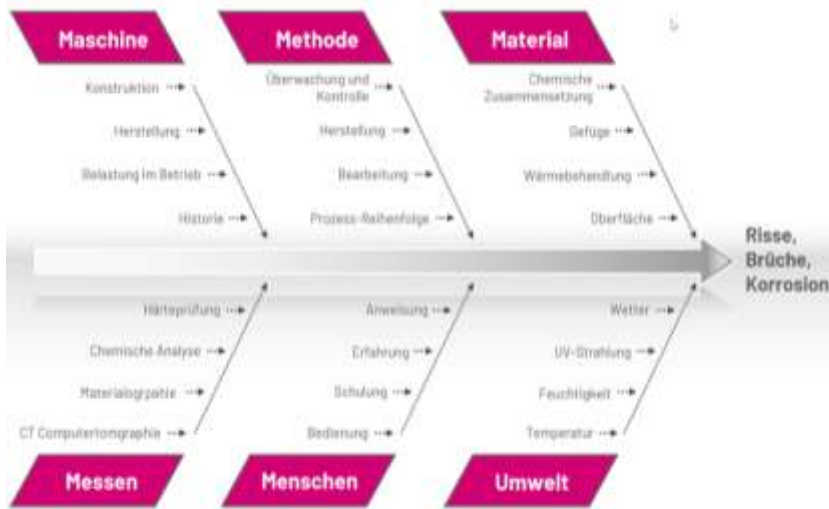
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EXPERTS

DAMAGE ANALYSIS

- damage due to processing, forming, heat treatment
- Damage to products, parts, machine and equipment components
- Structural damage (roof)
- Determination of the cause of breakage
- Damage due to wear, abrasion, tribology
- Corrosion phenomena and corrosion residues
- Aging and embrittlement of plastics
- Damage due to other environmental influences
- Damage to soldered connections of electrical components and circuit boards
- Investigation of tap water damage and sanitary damage, e.g. on flexible hoses, fittings and pipes



WISSEN SCHAFFT FORTSCHRITT®

- Damage to joints Welded seams
- Damage due to residue and particle channel
- Damage to airbag and safety components including pyrotechnics

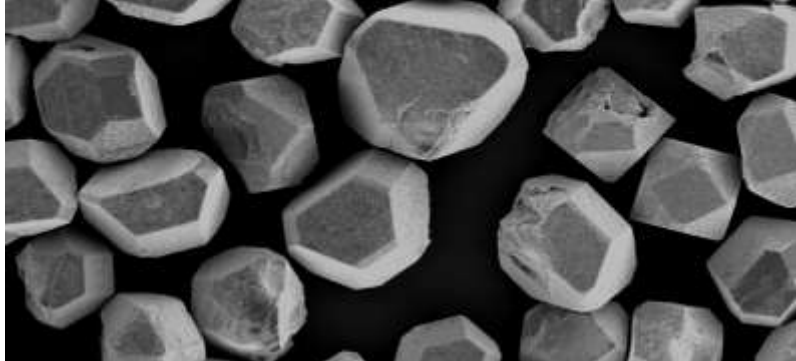


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EXPERTS



ADVICE ON MATERIAL AND PRODUCTION PROCESSES

- Advice on materials and production processes
- Decision support for material specific applications
- Experimental preliminary investigations for estimation of material optimization through heat treatment
- Edge layer and surface treatment



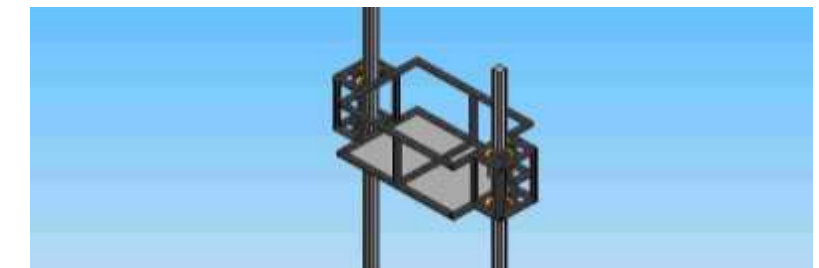
PRODUCT AND COMPONENT TESTS

- Advice on the appropriate test procedure
- Development of customer-specific test procedures
- Implementation of product test, benchmark and determination of test winner
- Production of special test fixtures
- Lifetime estimation, functional tests and weak point analysis



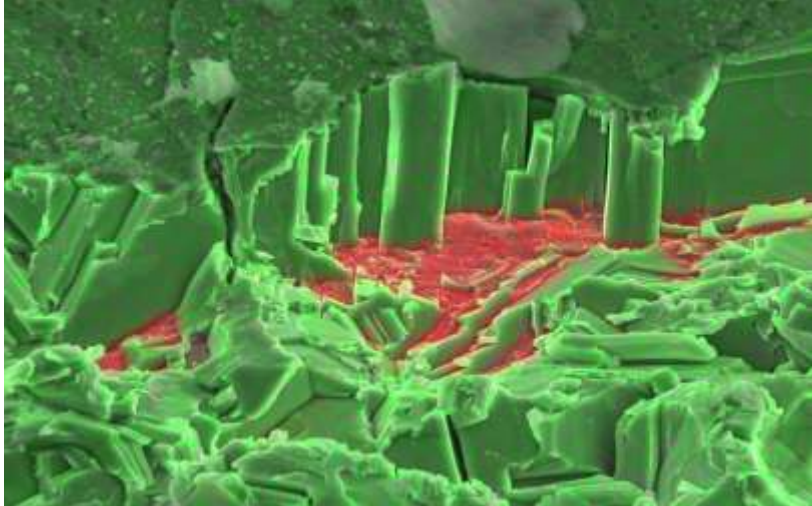
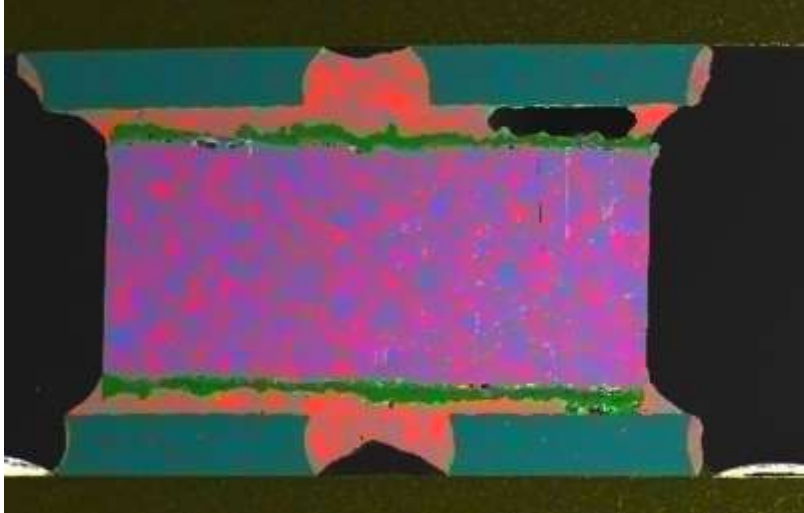
PROCESS CONSULTING

- Further development of production processes
- Auditing of processes
- Consulting in the area of quality assurance
- Advice on specifications and requirement specifications
- Optimization of test and production processes
- Support for laboratory setup and operation



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REFERENCES

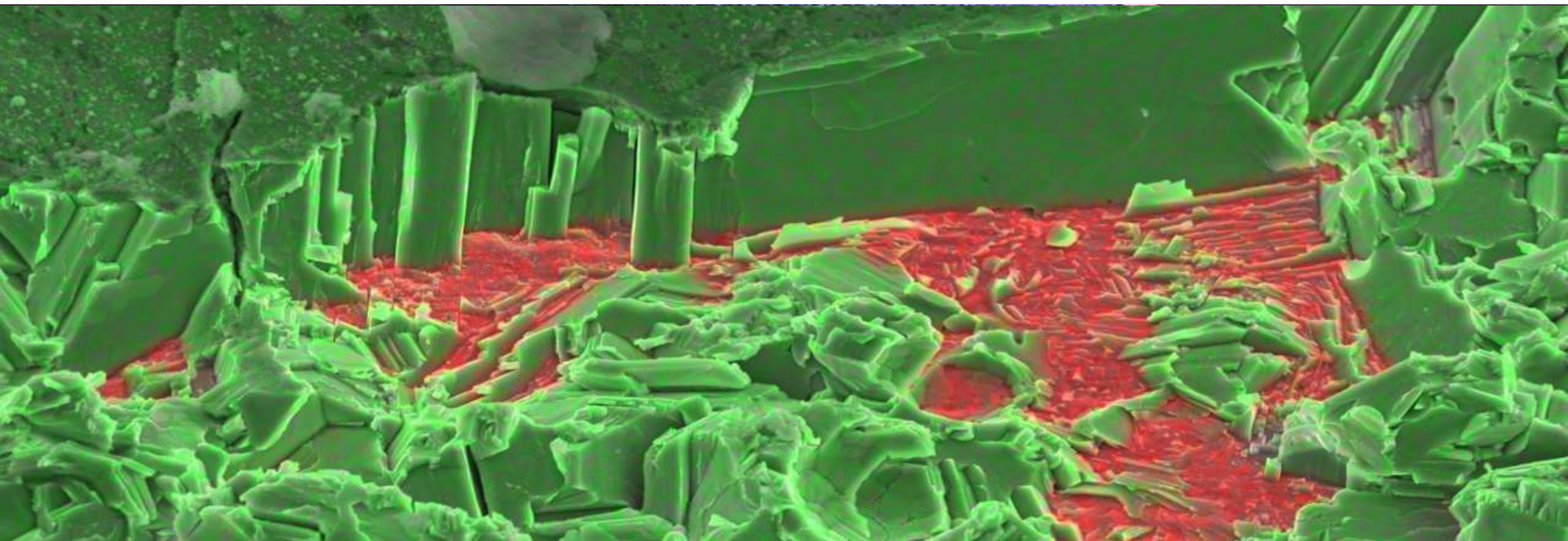


SHORT PORTRAIT

GWP is a full-service provider of materials technology for the manufacturing industry. 3,000 metal and plastics processing customers use our laboratories and workshops to ensure the quality of products and processes. And our experts develop innovations and analyze damage at a high level. Our expertise has grown over 40 years with 20,000 reports and covers the most important specialist areas of metals, plastics, composites, inorganics and explosives. The accreditation according to DIN EN ISO/IEC 17025:2018-03 ensures robust reports.



The accreditation is valid for the scope specified in the annex to the certificate.



WISSEN SCHAFFT FORTSCHRITT®