

R&D-Group "Bonding and surface technology"

Presentation of the activities

Michael Heilig



The enabler – for the plastics industry

Founded 1961 in Würzburg

Approx. 430 employees

More than 440 members in the network

Member of the Zuse Association

Accredited for testing, monitoring and certification



Overview of the business fields

430 members in the FSKZ network | Events with more than 13.000 participants annually

NETWORKING

Product monitoring
Product certification
Product testing
Expert opinions
Damage analysis

TESTING

Practical training
Workshops
Courses
In-house training
**Training for masters
and technicians**
Studies
Online-courses

TRAINING

Materials
Processing
**Inspection and
test methods**
Sustainability
Circular Economy
**Lightweight
construction**
Digitization

RESEARCH

ISO 9001
ISO 14001
ISO 45001
ISO 50001
IATF 16949
ISO 22000
ISO 13485
FW 605

CERTIFICATION



Objectives

- **Promotion of education and training, research, technology transfer**
- **Promoting young talents, e.g. SKZ lab or endowed professorship at the University of Würzburg**
- **Coordination of industrial experts**
- **Access to expertise, know-how transfer**
- **Committees activities at national and international levels (DIN, CEN)**
- **Creating synergies for material manufacturers, machine manufacturers, processors and users**

Membership development in the network



The enabler

for the plastic industry

E d u c a t i o n

Pre-competitive
Research

Collaborative projects

Bilateral
Development

SKZ

Das Kunststoff-Zentrum

An Institut of the
 ZUSE-GEMEINSCHAFT
 FORSCHUNG, DIE ANKOMMT.

Universities

Large institute associations

- Cognitive research
- no economic background
- no direct application reference
- often slow, sluggish, academic

Companies

- Demand from practice
- often low research capacities
- economically oriented
- quick solution necessary

Basic research

Stage of development

Product on the market



15.000 Customers



50 Trainer



130 Developer



Non-profit



Accredited testing
laboratory
ca. 1.000 Standards



23.000 m²
Laboratories &
Technical Centres



600
Events



10.000
Participants



100 Public
research projects

Material development

- Material/Additive Searches
- Formulation development
- Specifications, ...



Compounding & Compounding Processes

- Modification of thermoplastics, incorporation of additives ..
- Manufacture of customer-specific materials



Processing

- Extrusion (Profiles, tubes, foils)
- Injection moulding
- Welding (thermal joining, Hybrid joining)
- *Adhesive bonding*
- Thermoforming
- Blow moulding
- 3D Printing (Thermoplastics & Resins)

Surfaces

- *Surface pre-treatment/activation (Plasma, Corona, VUV...)*
- *Surface Characterization*
- *Tribology (wear and tear)*

Testing's & Analyses

- Mechanical tests (static, dynamic)
- Creep tests
- Thermal analysis
- Spectroscopic analyses
- Chemical analyses
- Weathering/Storage Tests
- Microscopy, SEM and CT measurements
- ...

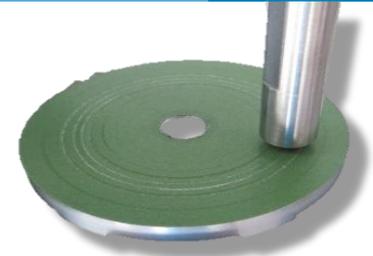
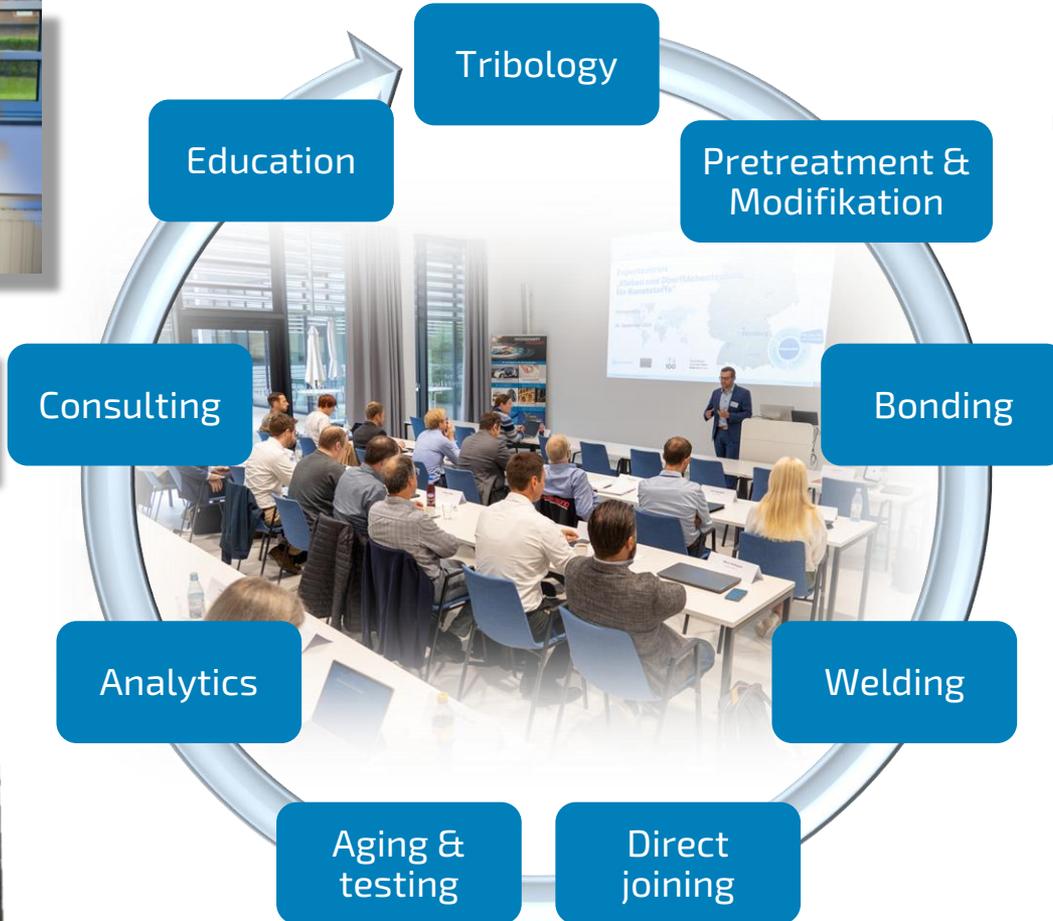
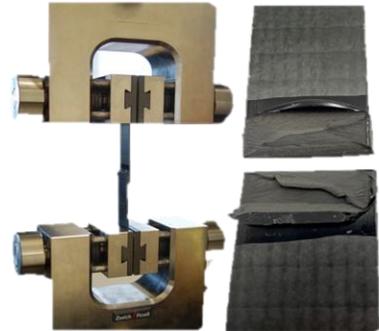
Other Areas

- Sustainability & Circular Economy
- Digitisation
- Non-destructive testing
- Reactive Systems / Crosslinking Materials
- Dispersion process, resin development
- Micro/nanosuspensions

Joining and surface technology

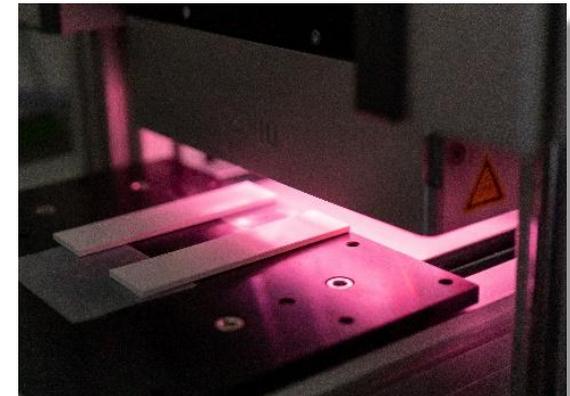
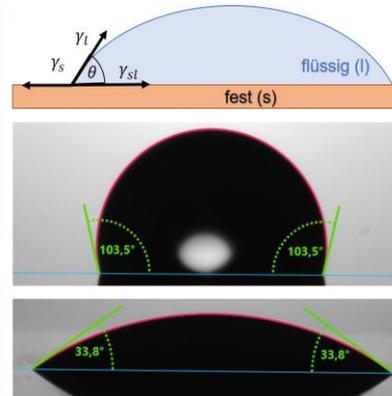
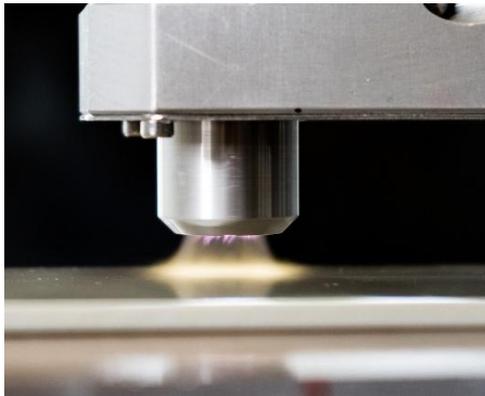
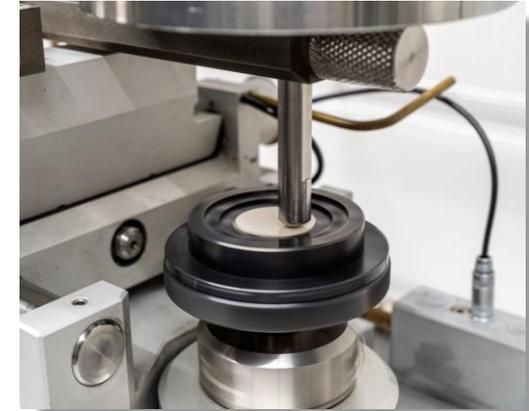
Knowledge creates connections!

SKZ

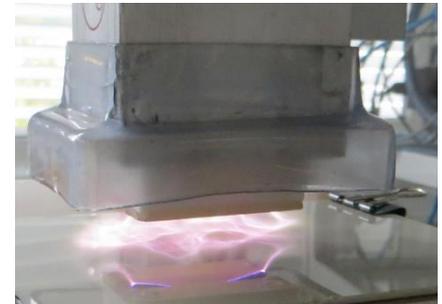
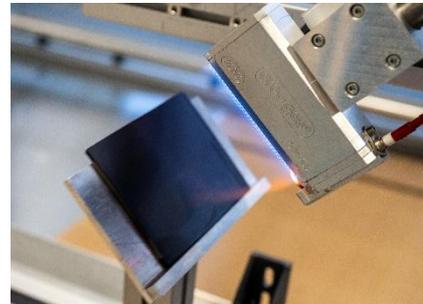
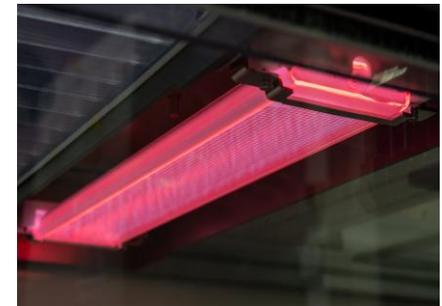
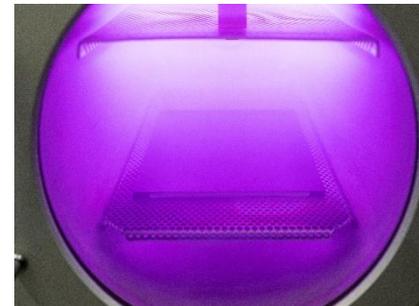
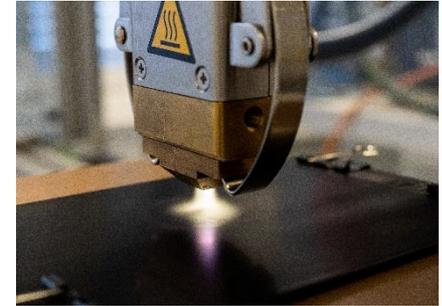
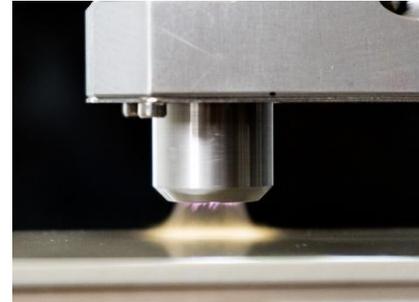


Industrial Service

- **Cleaning and surface functionalisation**
- **Surface characterization and measurement techniques**
- **Wetting and adhesion analyses**
- **Tribology (friction and wear)**



- Atmospheric pressure plasma (ADP) with rotating or static nozzle and plasma coating (corrosion protection, adhesion promoter, barrier,...)
- Low pressure plasma (NDP)
- VUV emitter
- Flame treatment
- Corona (direct or indirect)
- UV laser
- CO₂ laser



- **Contact angle measurements:**

- Free surface energy with polar and disperse components (DIN EN ISO 19403 (replaces DIN 55660), DIN EN 828)
- Hydrophobicity transfer (IEC TR 62039)
- Dynamic measurements: advancing and receding angles
- Stood-up drop technique
- Constrained sessile drop
- Heating chamber

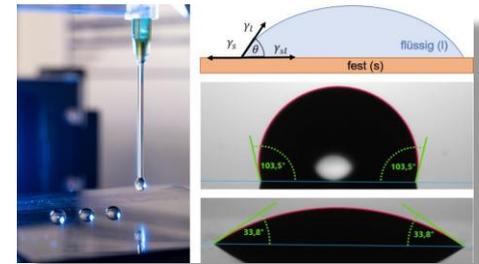
- **Tensiometer:** Density, surface tension, powders

- **Optical profilometer** for surface roughness measurement: focus variation, confocal microscopy, and white-light interferometry (DIN EN ISO 25178, DIN EN ISO 21920)

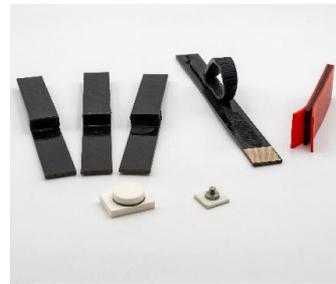
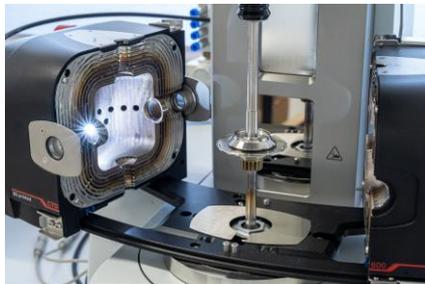
- **Infrared spectroscopy** (FT-IR with ATR, mobile systems)

- **Reflectometer** (film thicknesses 10 nm – 100 μm , refractive indices)

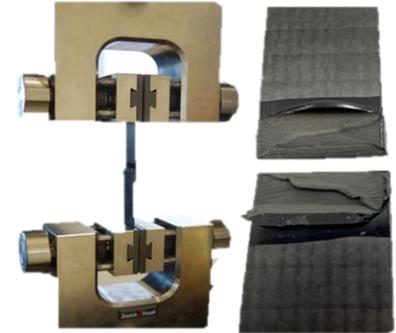
- **Calotte grinding** (DIN EN ISO 26423)



- **Qualified employees according to DVS/EWF (EAE/EAS/EAB)**
- **Specific adhesive selection & feasibility studies**
- **Tests in accordance with DIN, ISO, and DVS standards**
- **1K, 2K, and UV-curing systems & pressure-sensitive adhesive tapes**

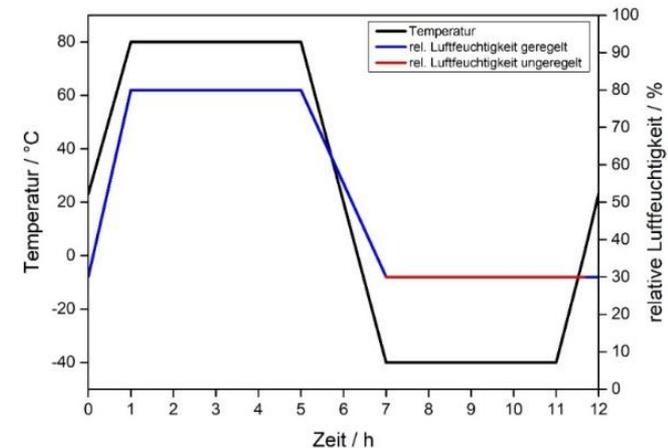
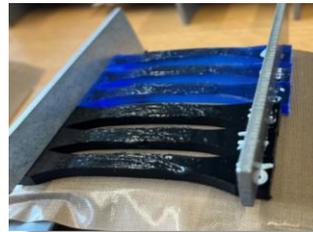


- Universal testing machines in the following load capacities:
10 kN, 20 kN, and 250 kN
- Testing devices for tensile, compressive, and bending loads
- With temperature-controlled chamber:
Temperature range -80°C to +250 °C
- Tribometers:
Measurement capability in oscillation or rotation
Coefficient of friction and online indentation depth (linear wear)



Accelerated ageing:

- Climate change test (PV 1200, DIN EN ISO 9142)
- Constant climate test (DIN EN ISO 6270)
- Condensation water test (DIN EN ISO 6270)
- Immersion tests/media storage (DIN EN ISO 175)
- Salt spray test (DIN EN ISO 9227)
- Cataplasms tests (DIN EN ISO 9142, Annex E2)
- UV aging (DIN EN ISO 4892-1, -2, -3)
- Stress crack testing (DIN EN ISO 22088-3)
- Fatigue properties



- **Differential Scanning Calorimetry (DSC):** e.g. DIN EN ISO 11357-2, DIN EN ISO 11357-3, and DIN EN ISO 11357-6
→ *Determination of melting points, crystallinity fractions, glass transitions, reaction enthalpies, oxidation sensitivity, etc.*
- **Thermomechanical analysis (TMA):** e.g. DIN 51045-1, ISO 11359-2,
→ *Determination of linear expansion coefficients, identification of glass transitions*
- **Laser Flash Analysis (LFA):** e.g. DIN EN ISO 22007-4
→ *Determination of thermal conductivity and heat transfer coefficient*
- **Thermogravimetry (TGA) coupled with FT-IR:** e.g. DIN EN ISO 11358-1
→ *Determination of filler content, formulation analysis, thermal stability, decomposition and degradation processes*
- **Dynamic Mechanical Analysis (DMA):** e.g. DIN EN ISO 6721-1, -4, -5, -6, -11, -12
→ *Characterization of viscoelastic properties as a function of temperature, time, and/or frequency; highly accurate determination of glass transitions; characterization of the temperature and frequency dependence of modulus and damping*
- **Rotational rheometers (plate-plate, cone-plate):**
→ *Rotational measurements for flow curves of polymer melts, oscillatory measurements for characterizing the viscoelastic behavior of polymer melts or the curing of adhesives*



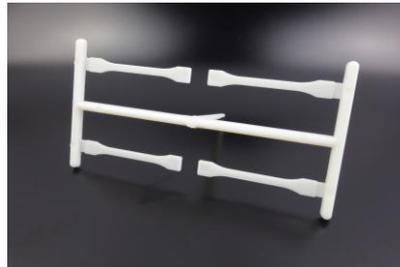
Examples of Service Packages

Industrial Service:

Standard Test Specimens

Our capabilities

- Injection moulding of *standard test specimens*
- Miscellaneous tension rods, impact rods, incendiary/LOI rods
- *Plates* for shrinkage measurement, puncture tests, electrical tests, ...
- Test specimens for welding/bonding tests
- ...



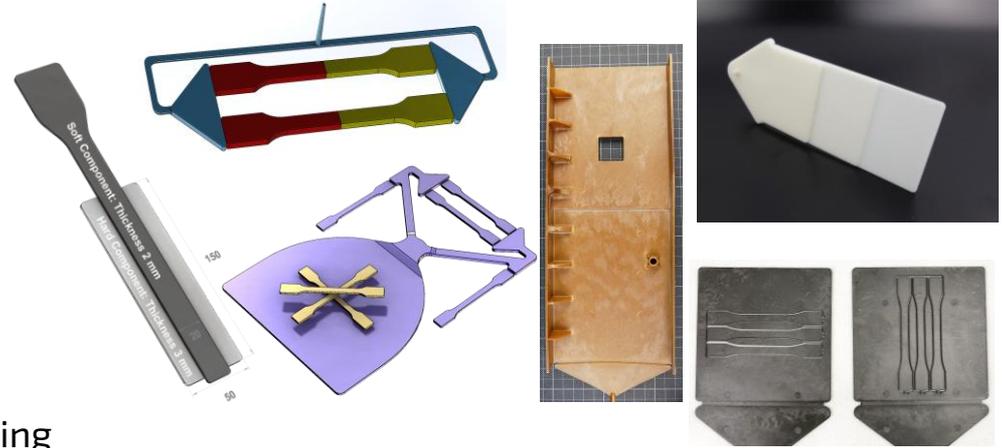
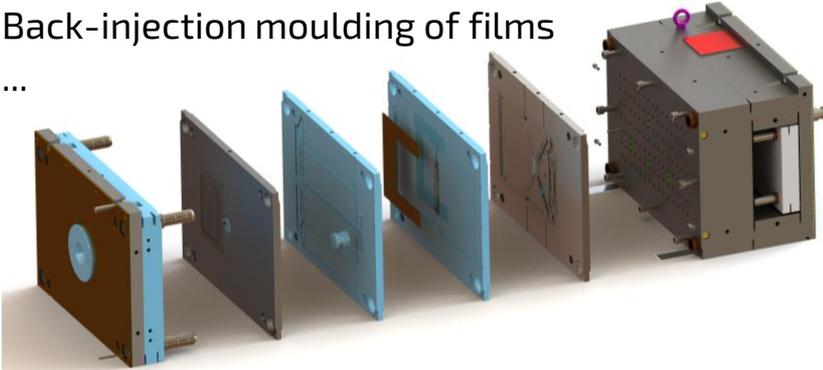
Our offer

- We manufacture your *test specimens* with qualified specialists
- The component is always a material-specific pre-drying, a moisture measurement and an injection moulding protocol
- In addition, almost all relevant tests and analyses can be carried out in our *accredited laboratory at the SKZ*

Industrial Service: Special Test Specimens

Our capabilities

- Injection moulding of *special test specimens*
- Plates up to 310x310 mm
- Plates up to a length of 450 mm
- Special Test Specimens for Fiber-Reinforced Thermoplastics
- Adhesion Test Specimens (Hard/Hard & Hard/Soft)
- Step plates with different surfaces for colouring tests
- Test specimens for foamed thermoplastics
- Back-injection moulding of films
- ...

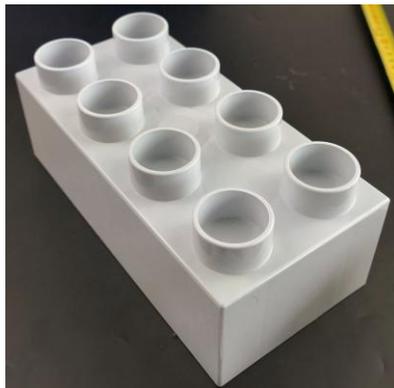
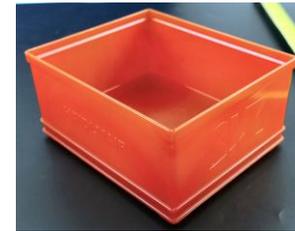


Our offer

- The production of *individual, customer-specific test specimens* is possible in conjunction with our universal master forms
- Dimensions, thickness, surface quality and, for example, connection can be adapted
- We can produce individual geometries for you from larger formats by means of sawing, milling or water jetting

Our capabilities

- *Many* injection moulds with components are available at the SKZ
- We use them as part of our practical courses and for the sampling of thermoplastics in customer trials
- In addition to hot and cold runner moulds, moulds with multiple cavities are also available



Our offer

- *Sampling* of thermoplastics regarding processability, demoulding behaviour, flow behaviour, cycle time, shrinkage & distortion, etc. with customer materials
- *Production* of sample parts for newly developed materials
- We are happy to lend our moulds to partners for customer or trainee events for a small fee

- **Courses for engineers and decision-makers**
- **Practice-orientated courses for specialists**
- **Refresher and further training courses**
- **Networking with industrial companies**



Courses Adhesive Bonding

Courses Surface Technology



The enabler – for the plastics industry



Our mission

as a pioneer for the plastics industry

SKZ



We are the leading specialists in the field of plastics.

We work closely with our customers and thus enable our customers to achieve top performance.

We always handle the tasks assigned to us reliably, conscientiously and confidentially.



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Contact

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