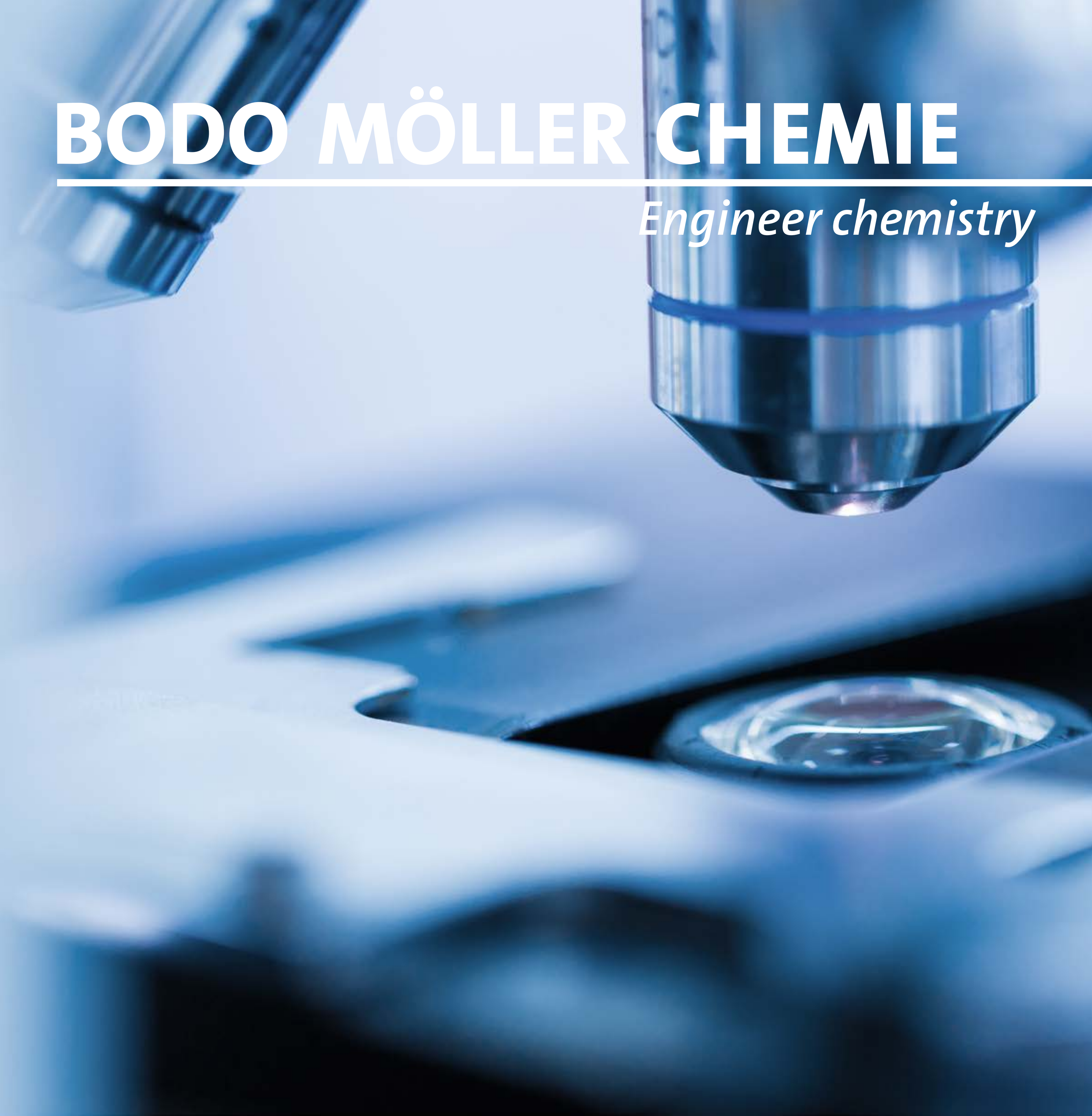
BODO MÖLLER CHEMIE

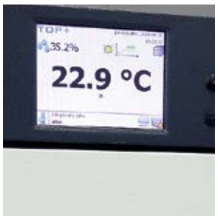
Engineer chemistry

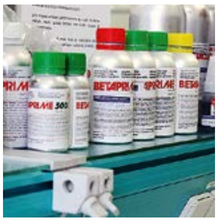


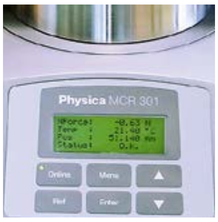
Your reliable partner for adhesive bonding

Adhesive laboratory

Test methods







Standard laboratory ageing conditions for testing adhesive connections

The most appropriate method accelerated aging will depend on the type of adhesive and adherent material, and the intended use of the adhesive joint. In general, stimulatory aging methods are used in which the aging conditions attempt to simulate natural conditions, usually with only a moderate acceleration of the factors. For examples of aging methods include: heat aging, water resistance, freeze-thaw, corrosion and chemical resistance, artificial weathering. The ageing conditions are applicable to bonded assemblies and may be used to constitute a set of tests for the evaluation of an adhesive. For general applications, the following overview may serve to suggest accelerating aging cycles as being both applicable and relevant to the major mechanism of degradation.

Exposure to moisture (cataplasm test)

Aging at extreme humidity and 70°C for 7 or 14 days, depending on the intended application.

Exposure to water and other liquids

Immersion on 20, 23, 40, 60 or 80°C for typically 150 to 1500h, depending on the intended application. Note that this type of exposure simulates degradation under elevated temperature and high humidity, but does note promote corrosive attack due to the lack oxygen in the immersion bath unless constantly aerated.

Aging on elevated temperature

Aging on elevated temperature in the absence of moisture especially promotes oxidation, embitterment and thermal degradation. Typical temperatures depend on the intended application. For adhesive bond under outside weathering temperatures of 80–120°C are common, depending of geographical area of application.

Thermal cycling

Accelerated aging tests under cyclic change of temperature include the freeze-thaw transition to consider the detrimental effect of water penetration and icing. Temperatures typically span from -20 or -40°C to 60 or 80°C with 95% relative humidity during the warm period of the cycles. Typical number of cycles range from 100 to 300h. It should be considered that rapid transitions between high and low temperature limits may induce thermal stress beyond levels representative of outside weather conditions, for example.

UV exposure

Climatic chambers with phytotron system are available to simulated aging conditions, combining moisture, temperature and UV radiations. The test duration depends on the irradiation doses to be expected in the specific application, and typically range from 500 to 3000h. Clearly, such tests should mainly be considered if one or both adherents is/are transparent to the applied spectra of radiation.

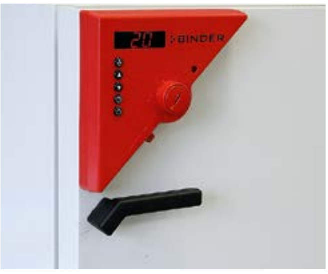
Salt spray test

The salt spray test is an accelerated corrosion test that produces a corrosive attack to the metal and coated samples. The appearance of corrosion products (oxides) is evaluated after a period of time. Test duration depends on the corrosion resistance of the metal or coating. Standard cabinets for corrosion testing create a salt spray environment at 35°C. Exposure times typically range from 300 to 1000h depending on the intended application.

Equipment

Cyclic corrosion chamber
Ascott CCip 450

Climatic chambers
Binder MKF 240 / Poleco TOP+



Drying ovens
Binder ED 53 / Binder FD 115

Universal testing machine
Zwick Z050 TN ProLine

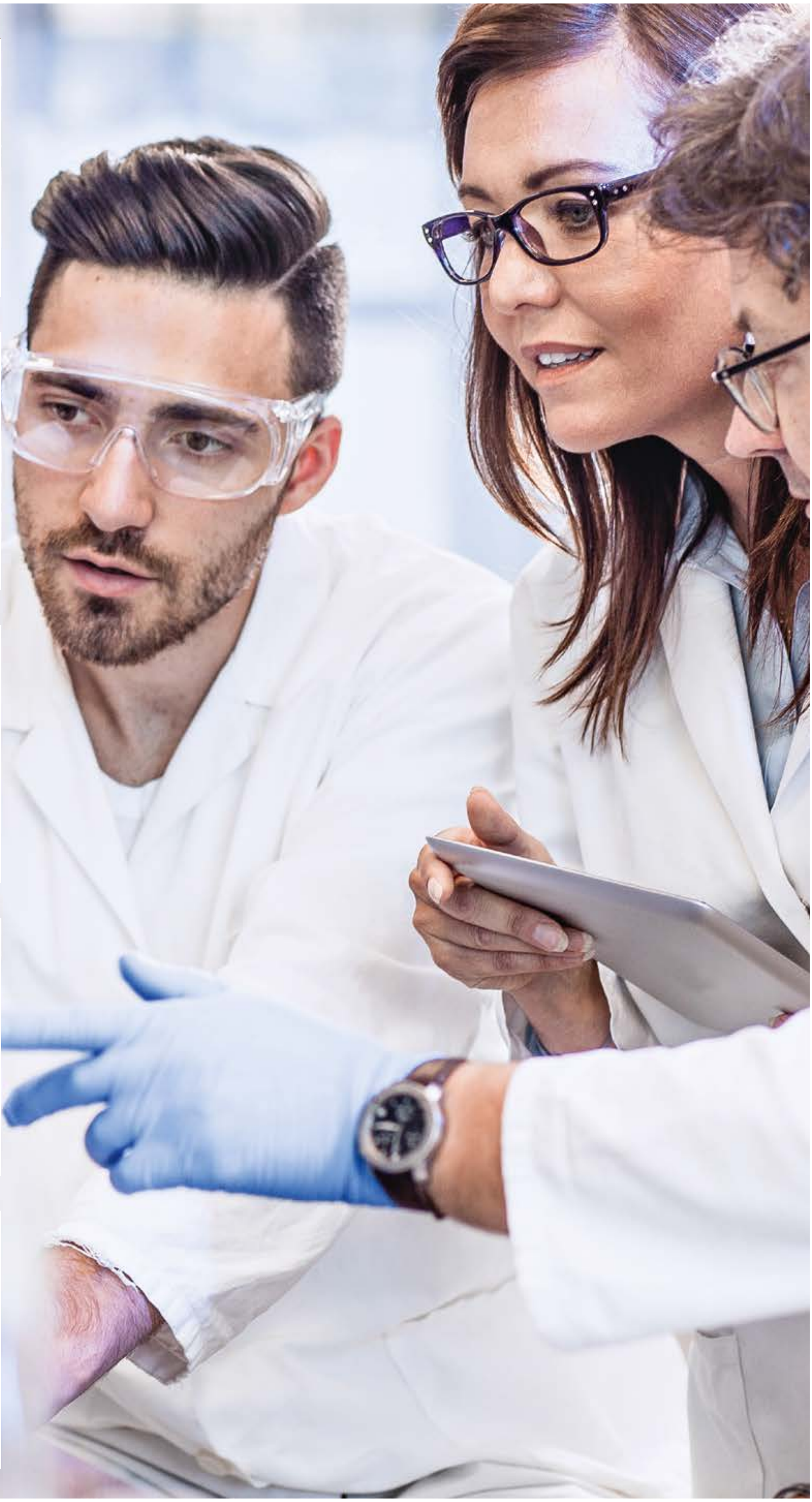
UV light aging test chamber ATLAS UVTest™

Laboratory freezer Fryka B30-40

Temperature and humidity measurement QMSystem Module QLabPoll

Viscometer Fungilab Smart Series L

Precision balance Sartorius to 4 kg/0.01 g



Test methods and equipment

Determination of mechanical properties

Type of Test & Properties:
Used to determine the tensile strength and more of various materials from metals to plastics
Capacities of 1 kN and of 50 kN
Tension, 90 degree, 180 degree, and T peel adhesion, shear, flexural

Equipment
Zwick Z050 TN ProLine
with wedge-screw grips-Fmax 50 kN

Determination of thermal properties of adhesives

Differential Scanning Calorimetry (DSC)
Measures other thermal and physical characteristics of polymers: glass transition temperature, melting point, curing efficiency, post-curing effects, phase transitions in thermoplastic polymers, thermal degradation of organic phase, oxidation of thermoplastics, filament content (accuracy of 0,01%), and more. We can also use these chemical analysis techniques to understand the «thermal history» of a material and determine failure modes.
Temperature range: -180°C – 700°C
Heating rates 0.001 K/min – 200 K/min

Equipment
Netzsch 204 F1 Phoenix
Mettler Toledo DSC 1

Thermogravimetric Analysis (TGA)
Measures the mass changes in a material as the sample is slowly heated. We can roughly determine the amount of water, volatiles, and non-volatiles in a sample by this technique.
Temperature range: RT to 1100°C

Equipment
Netzsch TG 209 F1 Libra
Netzsch Jupiter STA 449F3

Determination of thermo-mechanical properties of adhesives

Dynamic Mechanical Analysis (DMA)
Type of Test & Properties
Measures the mechanical properties of materials as a function of time, temperature and frequency. It is most useful for studying the viscoelastic behavior of polymers. One important application of DMA is measurement of the glass transition temperature under cyclic deformation, measurement of dynamic viscosity in oscillatory mode, storage modulus, loss modulus, viscoelastic behaviour of adhesives vs. temperature and shear rates or deformation amplitude, etc.
Temperature range: -150°C – 450°C

Equipment
Oscillatory rheometer, dynamic-mechanical thermal analyzer, DMTA apparatus Anton Paar CTD 450

Capillary rheometry has its origins in polymer melt processing. Based on controlled extrusion of a test material, capillary rheometry enables material flow and deformation properties to be characterized under conditions of high force (or pressure), high shear rate and at elevated temperature.

Capillary rheometer Dynisco

The Melt Flow Indexer can be used for measuring melt volume rate or melt flow rate in research applications and quality control.

Melt Flow Indexer Dynisco

The laboratory offers a humidity test, a salt spray test and other analysis.

BODO MÖLLER CHEMIE laboratory

Our laboratory is an independent adhesives and materials R&D, consulting, and testing laboratory, offering a comprehensive knowledge of adhesive technology. It is located in Poland in the High Technology Incubators Complex of Poznań Science and Technology Park of Adam Mickiewicz University Foundation. The High Technology Incubators Complex is the largest laboratory and office complex designed for innovative companies and offering a friendly environment for the development of new technologies.

Our laboratory utilizes a Quality Management System in conformance with ISO 9001:2008 as well as the certificate for manufacturing adhesive bonds in accordance with DIN 2304. Furthermore, the laboratory is certified by TBB Cert according to the DIN 6701 standard for adhesive bonding of railway vehicles and parts. As we fulfill our duty to establish, execute, and evaluate product and regulatory requirements, we do so reinforcing themes of comprehensive planning, reliable reporting, and continual improvement.

Our adhesive testing lab provides you with exceptional precision and versatility to test everything from adhesives and sealants to specialty materials and packaging.

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ISO standards

PN-ISO 4588-1999
Guidelines for the surface preparation of metals

PN-EN 13887:2005
Guidelines for surface preparation of metals and plastics prior to adhesive bonding

PN-EN ISO 9142:2005
Guide to the selection of standard laboratory ageing conditions for testing bonded joints

PN-EN ISO 291:2010
Standard atmospheres for conditioning and testing

PN-EN ISO 9227:2012
Corrosion tests in artificial atmospheres – Salt spray tests

PN-EN 13523-27:2010
Test methods: Resistance to humid poultice (Cataplasm test)

PN-EN ISO 10365:1998
Designation of main failure patterns

PN-EN 1465:2009
Determination of tensile lap-shear strength of bonded assemblies

PN-EN 28510-1:2000
Peel Test for a Flexible-Bonded-to-Rigid
Test Specimen Assembly – Part 1: 90 Degree Peel

PN-EN 28510-2:2000
Peel Test for a Flexible-Bonded-to-Rigid
Test Specimen Assembly – Part 2: 180 Degree Peel

PN-EN ISO 11339:2010
T-peel test for flexible-to-flexible bonded assemblies

DIN 6701-2:2006
Ahesive bonding of railway vehicles and parts
Part 2: Qualification of manufacturer of adhesive bonded materials, quality assurance

DVS 1618:2002
Elastic thick layer bonding in rail vehicle construction

DIN 54457:2014
Testing of adhesively bonded joints: Bead peel test

PN-EN ISO 2555:2011
Liquid polymers in form of emulsions or dispersions – determination of apparent viscosity by the Brookfield test method

PN-EN ISO 4892-1:2001
Methods of exposure to laboratory light sources –
Part 1: General guidance

PN-EN ISO 4892-2:2013
Methods of exposure to laboratory light sources –
Part 2: Xenon-arc lamps

PN-EN ISO 4892-3:2013
Methods of exposure to laboratory light sources –
Part 3: Fluorescent UV lamps

PN-EN ISO 9227:2014
Corrosion tests in artificial atmospheres – Salt spray tests

DIN 2304:2016
Quality requirements for adhesive bonding processes

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