

Hot Cells and Semi-Hot Cells

Materials Testing, Specimens Manufacturing, and Metallographic Examinations

Challenge

Materials and components testing and development, fracture mechanical and metallographic examinations and failure analysis of mechanical components are very specific tasks. They require the flexible and versatile combination of many mechanical-technological methods, machines and apparatuses.

Especially for highly radioactive material the demands are high, from the view point of handling and radioprotection.

Solution

The Hot Cells Facilities at the Radiochemical Laboratory in Erlangen meet those requirements and provide excellent infrastructure and highly experienced professionals for these challenging tasks. We offer and have experience with:

Materials testing

- Material examinations and testing of different fracture mechanics specimens for reactor pressure vessels surveillance programs according to international standards
- Material examination and testing of diverse materials and manufacturing components
- Relaxation measurements on springs and bending specimens
- Non-destructive material testing for crack determination
- Radiation resistance tests on plastics and adhesive joints as well as cable insulation and cable coating materials

Specimens manufacturing

- Manufacturing of Charpy, fracture mechanics and tensile specimens using modern machining equipment
- Manufacturing of reconstituted specimens with electron beam welding
- Manufacturing of test pieces from already tested specimens, material pieces and parts of failure pieces
- Complete manufacturing up to the introduction of mechanical and fatigue cracks, dimension measurements by digital photography

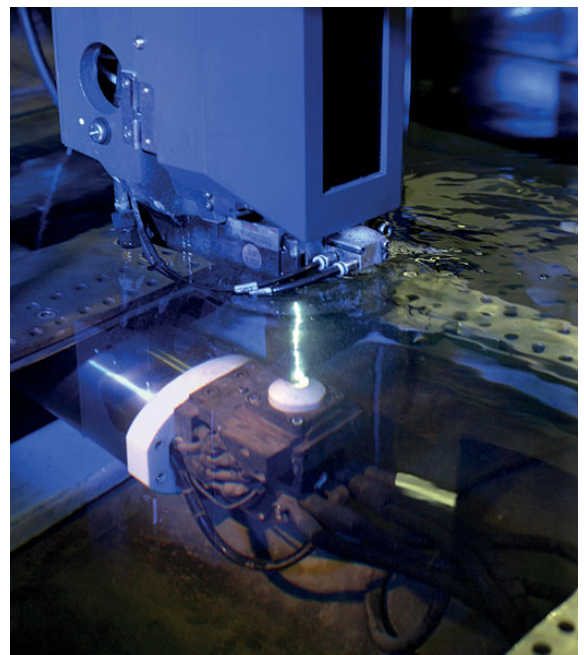
Metallographic examinations

- Failure analyses on different systems, e.g. steam generator tubes, springs, screws, center ring pins
- Microstructure examinations on metallic materials and nuclear fuel
- Further development of materials in cooperation with our customers, preparation of specimens for continuative examinations like scanning electron microscope and transmission electron microscope analyses

Your performance
is **our everyday commitment**



Tensile testing device in the hot cells



Wire erosion technique for the preparation of specimens

Customer benefits

- Urgent on-request metallography for root cause analysis
- Wide scope of material and components testing
- Long-term experience and high customer satisfaction
- Accredited to DIN EN ISO/IEC 17025, 9001 and 14001

Technical information

The Hot Cell Facilities gather a rather versatile and complex spectrum of methods for mechanical and metallographic examination and connected tasks:

Testing machines, equipment in cells / exhausters

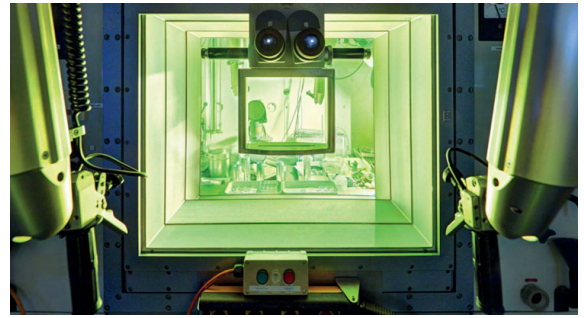
- Impact testing machine with instrumented 300 J and 15 J hammer, standard test temperatures -150°C up to +300°C
- Multi-purpose testing machines for alternate tension-compression load tests up to 5 kN, 200 kN and 600 kN, standard test temperatures -150°C up to +300°C
- Pellini machine for drop weight test specimens, test temperatures -150°C up to +300°C
- Resonance pulsator up to 20 kN and 250 Hz for fatigue precracking of fracture mechanics specimens and determination of crack growth rate
- Optical systems for fracture surface evaluation, crack propagation measurement
- Annealing equipment for annealing temperatures up to 600°C

Machines, equipment in cells / exhausters

- Electrical discharge machines (wire-guided)
- CNC-controlled milling and drilling machine with automatic 16 fold tool changing mechanism
- Turning lathes, milling machines
- Broaching machine
- Electron beam welding machine for welding depths up to 110 mm
- Demagnetization equipment, coil inner dimensions 230 mm x 230 mm and 230 mm x 1000 mm
- Diamond wire saw, cut widths 0.15 mm up to 0.7 mm diamond, circular, belt saws
- Standard machining equipment

Apparatuses and equipment in cells / exhausters

- Hardness tester for different testing ranges: micro, low load, macro
- Grinding and polishing tools as well as etching equipment
- Metallography microscopes with magnification of up to 1000, stereo microscopes with magnification of up to 50, each with digital camera systems
- Cutting and abrasive equipment (diamond abrasive cut-off, diamond wire saw, other saws)



Sample preparation in the hot cells



Microscope grinding evaluation



Wire erosion device

Key figures

2 hot cells allow handling up to 10^{14} Bq

2 material testing cells

3 metallography/chemistry cells

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