



List of technical equipment and testing methods

Specimen production / sample preparation

- Concrete laboratory including concrete mixers 10 l, 80 l and 270 l, fresh concrete testing, production of concrete specimens
- Cement and mortar laboratory including different mixers, fresh mortar testing, production of mortar samples
- Aggregate testing laboratory: sieving machines, Los Angeles test
- Devices for concrete cutting and polishing
- Concrete cutting and grinding, core drilling machines
- Laboratory van for on-site testing equipped with drilling core machines and fresh concrete testing devices
- High temperature furnaces for syntheses of clinker phases and lab clinkers

Mechanical testing

- Compression testing machines, range 5 kN to 5000 kN
- Tensile testing machines, maximum range 50 kN
- Bending tensile testing machines, maximum range 160 kN (3- and 4-point)
- Dynamic and static modulus of elasticity
- Creep testing machines, maximum range 90 kN, 250 kN, 600 kN
- Individual, customized testing methods are possible

Porosity / Permeability / Durability

- Several climatic chambers
- Freeze cabinets (min temperature -25°C) with 20°C water flooding
- Permeability measurement (oxygen, water)
- Chloride diffusion and conductivity
- Oxygen permeability / Oxygen diffusion

Analytical Methods

- Isothermal heat flow calorimeter, semiadiabatic calorimeter
- Ion chromatography
- Rotational rheometer with air bearing for cement pastes and mortars
- Measurement equipment for zeta potential determination of particle suspensions
- Atomic force microscopy
- Thermal analysis (TGA, DTA, DSC)
- Environmental scanning electron microscope (ESEM) including different preparation techniques

- Optical microscopy (transmitted light, reflected light) including different preparation techniques
- pH-meter
- Preparation of pore solutions from fresh and hardened cement pastes
- Determination of organic carbon (TOC) in aqueous solutions
- Chemical shrinkage
- Autogenous shrinkage
- Plastic shrinkage
- ^1H nuclear magnetic resonance spectroscopy (NMR)
- Laser particle sizer

In cooperation with other sections at Empa we have access to various other techniques like

- X-ray powder diffraction
- X-ray fluorescence analysis
- Infrared and Raman spectroscopy
- Wet chemistry (ICP-OES, ICP-MS, TOC, etc.)
- Mercury intrusion porosimetry
- Solid-state nuclear magnetic resonance spectroscopy (NMR)