Mechanical Characterisation of Ceramics, brittle Materials and Components

Empa
Materials Science and Technology

Services offered by

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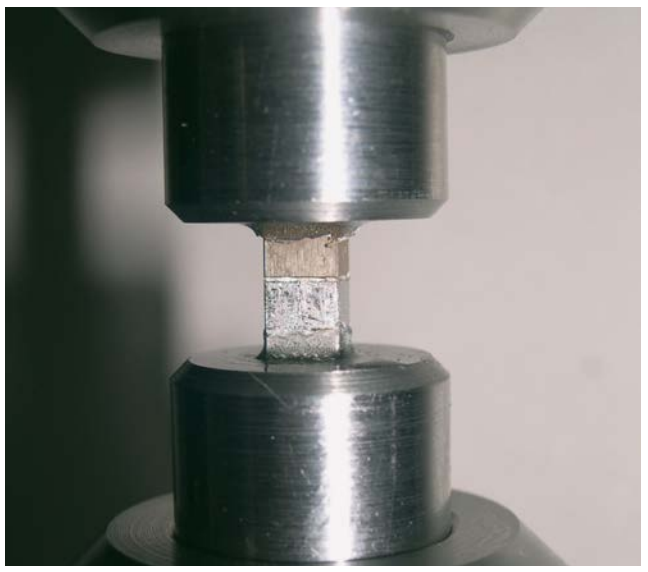
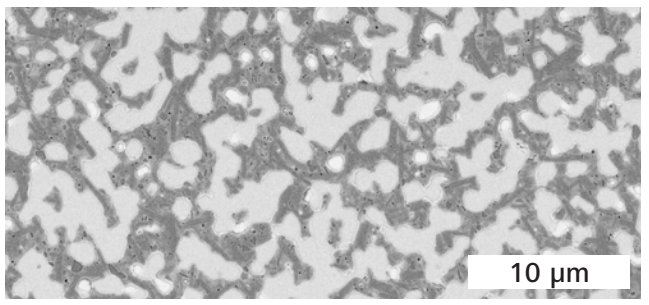
Materials



Tensile strength test of a Metal-Ceramic joint

Ceramics
- monolithic
- reinforced (with particles, whiskers, fibers, nano-fibers, CNT)
- conductive, non-conductive, piezo-electric

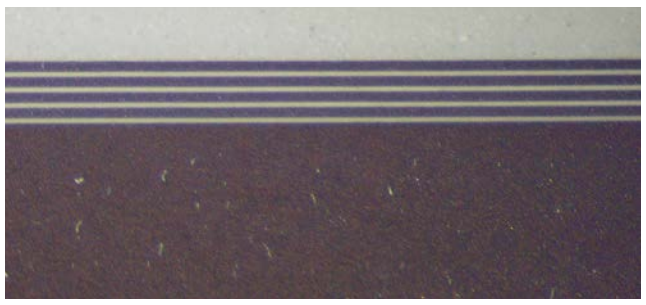
Composites
- ceramic-ceramic (CMC)
- metal-ceramic (MMC)



BSE: Si_3N_4-$MoSi_2$ composite

Ceramic laminates
- macro (e.g. wear parts)
- micro (e.g. sensors)
- coatings

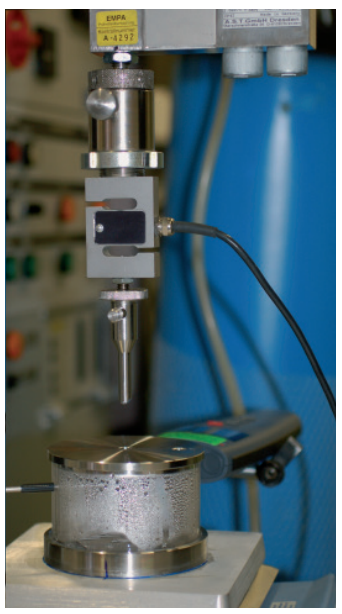
Joined materials (brazed, glued)
- ceramic with ceramic
- ceramic with metal



Ceramic laminate. The white outer layers have a thickness of ~50 µm.

and many more, e.g.
- porcelain (e.g. isolator)
- glass (e.g. accessories, controls, instruments)
- long fibers
- porous bodies and foams
- green-bodies

Properties



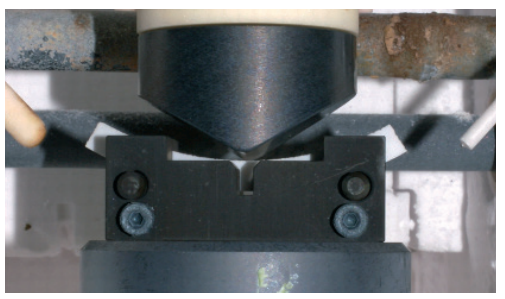
Lifetime test on piezo-electric sensor element under humid operating condition.

Strength up to 1'500°C
- 3-point and 4-point bending
- biaxial flexural (ring on ring)
- ball-on-three-ball (small discs)
- C-ring
- shear

Fracture toughness
- SEVNB: Single Edge V-Notched Beam up to 1'500°C
- SCF: Surface Crack in Flexure
- SEPB: Single Edge Pre-cracked Beam
- edge chipping

Young's modulus, Shear modulus, Poisson's ratio
- natural frequency up to 1'000°C
- bending up to 1'500°C (Young's modulus)
- instrumented indentation (Young's modulus)

Hardness
- Vickers and Knoop
- dynamic hardness



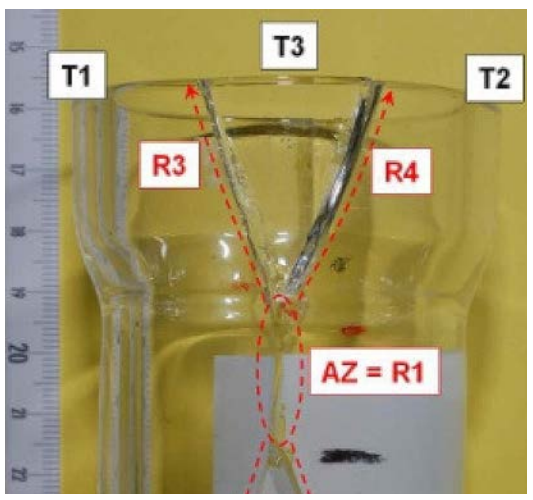
Thermo-mechanical characterization of Solid Oxide Fuel Cell component

and many more, e.g.
Lifetime, e.g. subcritical crack growth under
- static or cyclic load
- constant stress rate

creep resistance up to 1'600°C
- tensile load

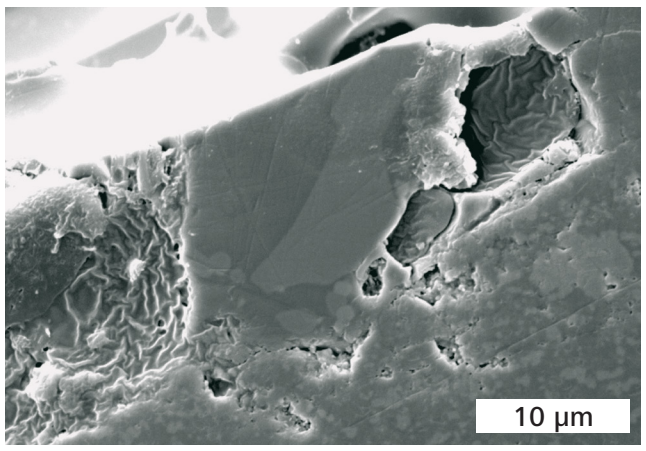
thermal shock resistance

Complementary expertise



Failure analysis on a flow meter

Development of ceramic based composites
Failure analysis
(fractography)
Microstructural analysis
Thermo-mechanical characterization
Oxidation and corrosion resistance tests
(various gas atmospheres, up to 1'500°C)
Detection of crack initiation
(acoustic emission)
Development and validation of mechanical tests
(methods, equipment, standards)
Statistical analysis
(mainly Weibull)
Education and training of staff



Damage on Si_3N_4 based composite test sample after severe oxidation test

Your advantage

Professional expertise for consulting, testing, analysis and use of brittle materials.

Your contact

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