

Introduction to Mechanical Testing at the Micro/Nano-scale

Alemnis AG, Thun, Switzerland
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Abstract:

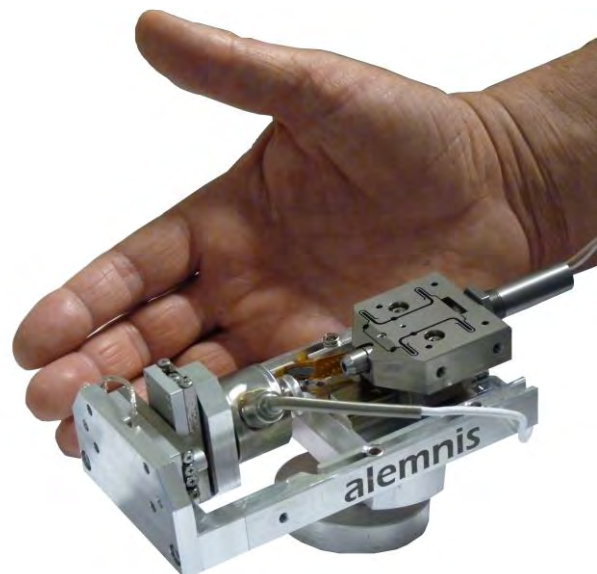
Recent advances in materials for structural applications have pushed the need for mechanical testing at the micro and nanoscale. This has spawned a host of micron scale techniques - some directly adapted from conventional tests for small length scales like miniaturized tension and compression tests, and others like instrumented indentation and microcompression tests that are of more recent origin. Among these, nanoindentation has emerged as the most widely used and versatile technique for mechanical testing of thin films, miniaturized devices and materials at small length scales over the past two decades, partly due to ease of testing and minimal sample preparation. The addition of in-situ observation of the material deformation characteristics in the SEM and TEM enables researchers to draw conclusions on the operative deformation mechanisms, an important criterion for structural materials design.

This talk aims to introduce the new instruments developed by Alemnis to address the emerging techniques in the field of in-situ micron scale testing. Case studies of in-situ mechanical tests will be presented to cover not only hardness and modulus measurements but also emerging experimental techniques that enable extraction of fracture toughness, time dependent plasticity (creep, relaxation and strain rate sensitivity) and fatigue properties at the micron scale. Recent advances like variable temperature measurements (both cryo and high temperature testing), high dynamic testing (for fatigue and impact tests) and combining micron scale mechanical tests with x-rays, Raman and EBSD will also be introduced.

Jean-Marc Breguet short bio:

He holds a PhD in Micro-engineering from the Swiss Federal Institute of Technology, Lausanne (EPFL). He has more than 18 years of professional experience in academia as lecturer and senior researcher at EPFL and at EMPA and 20 years of professional experience in industry (Toppan Printing Co in Japan, Faulhaber-Minimotor, CSEM, Alemnis).

In October 2013, Jean-Marc Breguet was appointed CEO at Alemnis and group leader at EMPA. From October 2016, he is full time CEO at Alemnis.



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