

Media release

Successful CTI project

High-tech instrument to measure mechanical characteristics of living tissue

Neuchâtel, 29 May 2013 – In a recent CTI project, CSEM and CSM Instruments developed a new instrument that can measure the elasticity of biological tissue, the only instrument of its kind. It will help us to better understand illnesses such as arteriosclerosis, and how tumors begin. It will also serve to find new diagnostic methods, and to develop and optimize tissue scaffolds.

In many illnesses, including arteriosclerosis, osteoarthritis, and cancer, the elasticity of biological tissues changes. Better understanding of these diseases and the development of diagnostic methods, require improved insight into the mechanical characteristics of the tissues involved. Until now, however, researchers have not had the necessary instruments to achieve this. The new tool developed by CSM Instruments together with CSEM fills this need. The “Bioindenter” was developed during an 18-month Commission for Technology and Innovation (CTI) project—part of the special innovation program that was established to counter the effects of the strong Swiss franc. Thanks to the Bioindenter, it will be possible for the first time to measure the local elasticity and rigidity of soft materials in a physiological environment.

Learning from testing the material

Bioindenter is an excellent example of successful cooperation between research and industry in a CTI project. CSM Instruments worked together with CSEM to find a solution to their problem, benefiting from the specialized knowledge of their external research partner.

The Neuchâtel-based SME CSM Instruments develops and manufactures precision instruments to characterize the mechanical properties of hard surfaces in the nano and micro range. “Clients have long been saying that they need to be able to examine soft biological materials as well,” says Jiri Nohava, applications engineer at CSM Instruments. In order to modify existing characterization instruments for soft samples, the engineers at CSM Instruments developed a force sensor that works with very small forces in the range of micro-Newtons. They also optimized the instruments and modified the software. It was additionally necessary to develop a holder for the biological samples. Here, CSEM was the right research partner—one with a broad range of experience developing instrumentation for both biology and nanotechnology.

An interdisciplinary approach

The biological sample holder, the Biochamber, must fulfill various conditions. The samples to be measured must be kept in a liquid environment at body temperature. And the holder must be compatible with existing tissue-culture containers. Ideally, it should also be possible to observe the indentation process *in situ* with a microscope. The two partners developed a functioning prototype in nine months. It is compatible with common laboratory plastic and glassware, and it has a temperature controller to ensure suitable conditions for the sample. CSEM also integrated a microscope into the Biochamber. “The interdisciplinary approach of CSEM really paid off in this project,” says Gilles Weder, project head at CSEM. “In the team, there are biologist, physicists, chemists, and engineers working closely together.” Another key factor for this successful collaboration was the geographical proximity of the two partners and the broad experience of CSEM in CTI projects in collaboration with industry.

Capturing a new market

The new instruments can be used across a broad range of fields. Their principle use is in research, in order, for example, to investigate the development of illnesses or for fundamental studies of biological tissues. But the great market potential in the future will be in new diagnostic methods, as well as in tissue engineering for the development of implants and devices, such as contact lenses, that can be integrated with human tissue. The project has enabled *CSM Instruments*' move into the growing life-sciences market.

Dedicated website and half-day testing sessions

Detailed information and a short video displaying Bioindenter's key features can be found at www.csem.ch/bioindenter. Upon request, CSEM and *CSM Instruments* will be happy to present the Bioindenter in half-day sessions available for testing of tissue samples.



© CSEM / CSM Instruments – *The Bioindenter is a new instrument dedicated for the mechanical analysis of soft biological samples in physiological conditions.*

Additional information

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About CSEM

CSEM – a center for innovation

CSEM SA (Swiss Center for Electronics and Microtechnology), founded in 1984, is a private Swiss research and technology organization specializing in microtechnology, nanotechnology, microelectronics, systems engineering, and communications technologies. Around 400 highly qualified and specialized employees from various scientific and technical disciplines work for CSEM in Neuchâtel, Zurich, Muttentz, Alpnach, and Landquart.

In the fields of nanotechnology and life sciences, CSEM develops high-tech solutions for the industry. The interdisciplinary cooperation of specialists from physics, engineering, biology, and chemistry, along with a lab structure, form an ideal environment for complex research and development.

Additional information is available at www.csem.ch.

About CSM Instruments

CSM Instruments develops, manufactures, and sells instruments to characterize mechanical properties of surfaces for research labs and industries worldwide.

A variety of measuring instruments allows the mechanical characterization of a wide range of surfaces, bulk materials, and micro structures. This includes the testing of the adhesion of paints, optical thin films, or hard coatings. Dynamic testing measurements (nano hardness measurement) can be performed to define not only the hardness of the material, but also to evaluate the plastic and elastic deformation, the elasticity module, or creep.

Additional information is available at www.csm-instruments.com

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