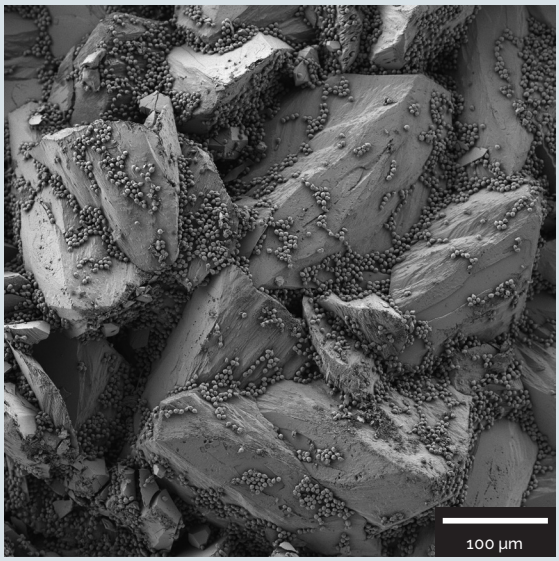
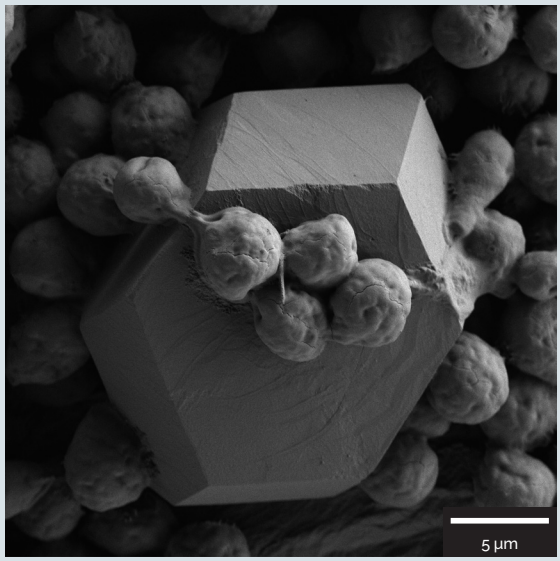
TESCAN CLARA: Ideal for imaging of life science samples also in cryo conditions

With life science research development and its efforts to reveal more and more ultrastructural detail, imaging methods need to cover a broad spectra of demanding applications. Recent investigations of cell morphology, development of biocompatible materials, tissue engineering research, microbiology, pharmacology, food and cosmetic studies rely on advanced imaging techniques. The dominant characteristic features for the majority of life-science specimens are their high water content, non-conductivity and sensitivity to the electron beam.

TESCAN develops and manufactures state-of-the-art scanning electron microscopes (SEM) designed to fit the needs of numerous life science applications. Using TESCAN CLARA equipped with field emission Schottky cathode, BrightBeam™ column and a powerful and versatile detection system, the investigation of detailed morphological structures as well as the ultrastructure of non-conductive biological specimens has become a straightforward procedure. Even with extremely low accelerating voltages and beam currents, fine structures of delicate specimens can be visualized. When equipped with cryo workflow, TESCAN CLARA represents a state-of-the-art scanning electron microscope for everyday experiments in life science laboratories.



c **Fig 1:** A viticulture microbial community includes a wide range of yeast and bacterial species. Potassium bitartrate crystals also know as wine stone or wine diamonds cause crystalline turbidity in a wine bottle. Overview image shows wine stone structure with yeast cells on its surface [1].



c **Fig 2:** The crystalline turbidity in a bottle is caused by extensive saturation of wine with potassium bitartrate after the bottle is exposed to low temperature. Detail shows yeast cells adhering to the surface of a single crystal of potassium bitartrate [1].

TESCAN CLARA is based on the S8000 platform.

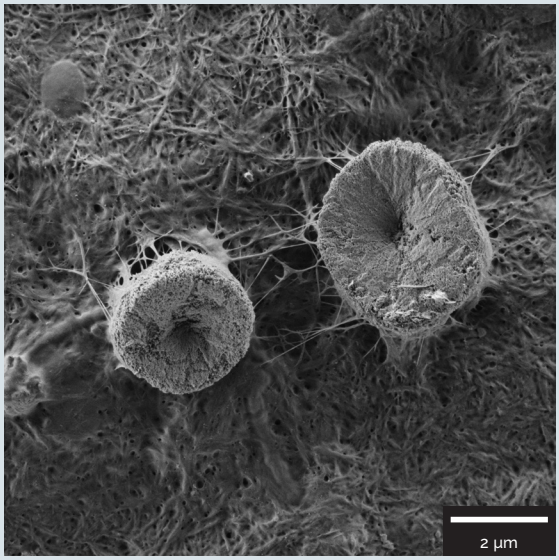


Fig 3: Bacterial cellulose is pure, biocompatible and highly versatile material. It can be combined with various biopolymers and micro and nanoparticles in order to be used in a wide range of applications including food industry, medicine, commercial and industrial products and other fields. To be able to visualize the ultrafine network of nanocellulose fibrils, low beam voltages and beam currents need to be used to obtain high resolution images of such a non-conductive and charging specimen [2].

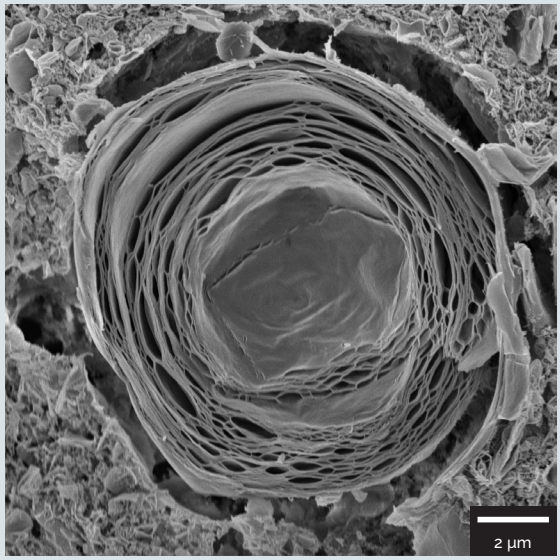


Fig 4: One of the methods to process and observe hydrated specimens as close as possible to their native state is cryo fixation and investigation of the frozen specimen under the temperature of liquid nitrogen. This method is highly utilized in food research, pharmaceutical research and in development of cosmetics, personal and homecare products. As an example a visualization of a softener solution can be used. To preserve inner layers of softener microcapsules, high pressure freezing and subsequent imaging with dedicated ET detector was used to maintain topography and to suppress unwanted charging [3].

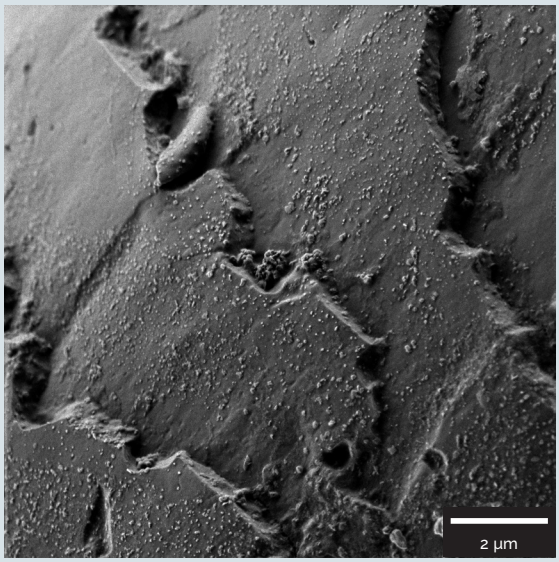


Fig 5: SEM analysis of a hair treated with cosmetic products broadens the range of applications suitable for TESCAN CLARA SEM, including cosmetics and personal care products development. Overview image of non conductive human hair obtained with an ET detector using accelerating voltage of 1 keV.

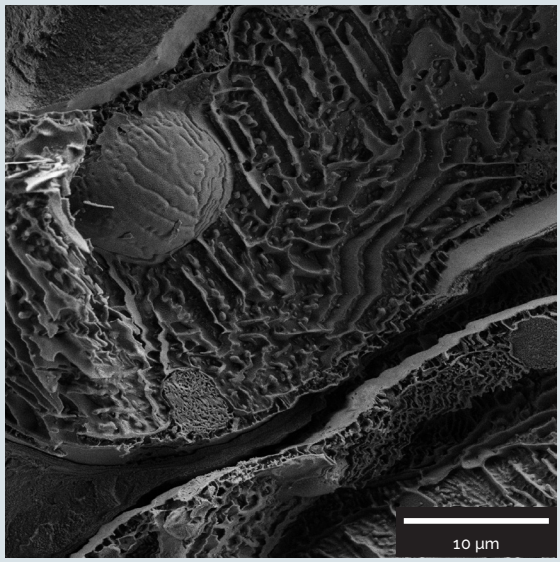
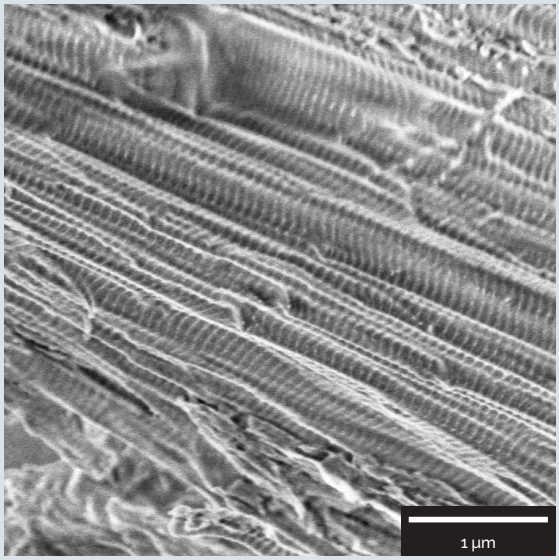
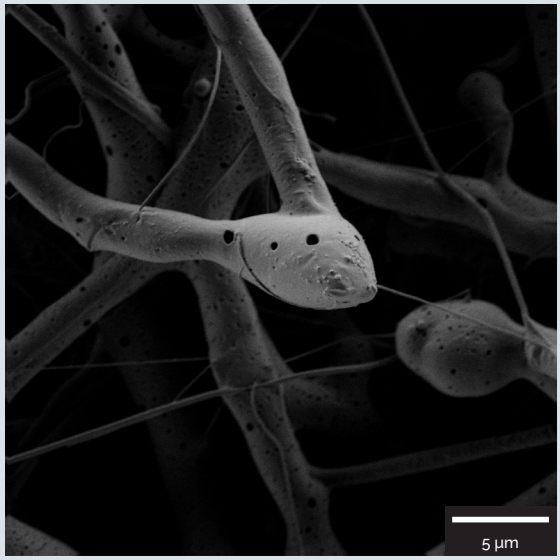


Fig 6: SEM image of cryogenically fixed and freeze fractured red pepper reveals internal structures of plant tissue, such as distribution of oil droplets that contain alcaloid capsaicin. DEPTH mode was used to cover high topography with large depth of focus. 2 keV, ET detector. Low probe current is used to prevent sample heating.



c **Fig 7:** Sensitive, delicate and highly charging samples like the threadlike structure above are difficult to observe even after sputter coating. To visualize such delicate structures, low beam energies and low beam currents are utilized along with an efficient detection system. Collagen fibers are a perfect example where the combination of all previously mentioned features are necessary. The topography of collagen fibers acquired at **100 eV** in combination with Axial detector is shown here.



c **Fig 8:** Molds and their network architecture is a challenge for observation in SEM. The combination of in-chamber E-T detector and BrightBeam™ technology of TESCAN CLARA microscope provides high resolution information on morphology without the necessity to use conductive coating. Image acquired at **700 eV**.

References:

1Sample courtesy of Faculty of Horticulture, Mendel University in Brno, Czech Republic.

2Sample courtesy of Dr. Levente Csóka, University of Sopron, Hungary.

3Sample courtesy of Jane Munro-Brown, Unilever U.K. Central Resources Limited

AXT PTY LTD
Authorised Distributor
TESCAN
Australia & New Zealand

1/3 Vuko Place
Warriewood
NSW 2102 Australia

+61 (0)2 9450 1359
axt.com.au
info@axt.com.au

TESCAN ORSAY HOLDING, a..s.
Libušina tř. 21, 623 00 Brno - Kohoutovice / Czech Republic
(phone) +420 530 353 411 / (email) sales@tescan.com / marketing@tescan.com