Observation of Bread Yeast with Cryo-SEM

Instrument used: Scanning Electron Microscope (SEM)

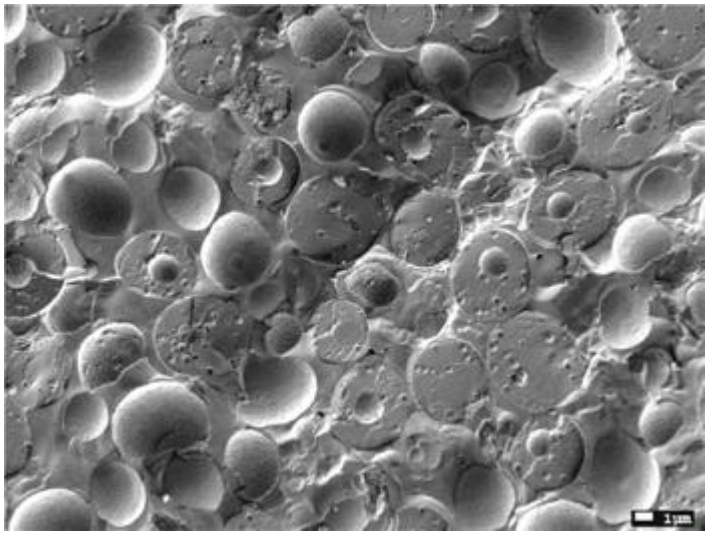
Cryo-SEM, which allows SEM imaging of a hydrated specimen in a frozen state, is used for various applications, such as biotechnology, medicines, cosmetics and foods. Cryo-SEM consists of two specimen stages. The first stage is used in a specimen preparation chamber for fracturing, etching (ice sublimation) and conductive coating. This stage can then be transferred to the second cryo-stage located in the SEM for observation. Both of the stages are cooled by liquid nitrogen and also are temperature-controlled with a heater for allowing etching.

Using Cryo-SEM, a hydrated specimen, which is rapidly frozen by slush nitrogen in the air, can be imaged while keeping the 'natural' state of the specimen. This avoids dehydration of the specimen that can lead to distortion of the surface structures. It also allows imaging of oils and other components that are not observable at room temperature under vacuum. As an observation example, cryo-SEM of bread yeast is presented below.

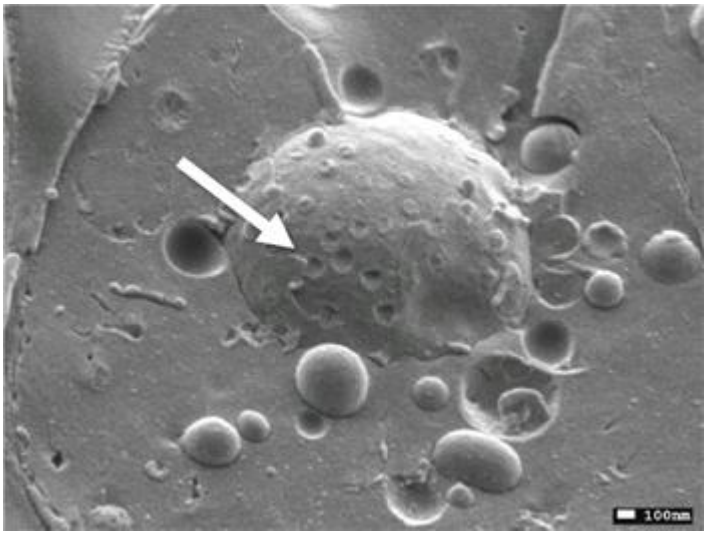
Observation of bread yeast

A specimen was dehydrated yeast which was returned to its original state by water. The yeast specimen, rapidly frozen by slush nitrogen, was loaded into the specimen preparation chamber using an airlock chamber and freeze-fractured. Etching was applied to the specimen at -90 ˚C for 5 minutes, before coating with platinum for SEM observation.

The use of a Schottky field emission scanning electron microscope enables acquisition of high magnification images, even at a low accelerating voltage of 1.5 kV. The freshly fractured surfaces and cross sections of the yeast at medium magnifications were observed (left image). In addition, at higher magnifications, the fine structures of nuclear pores (indicated by the arrow) were clearly seen (right image).



Accelerating voltage: 1.5 kV, Magnification: x3,000



Accelerating voltage: 1.5 kV, Magnification: x30,000
Arrow: Nuclear pore

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