Analysis for Cell Structure by using Cryo STEM Tomography

Recently, several studies for observation of biological specimens as plastic section have been performed by using STEM, and the potential has been indicated. STEM tomography offers several important advantages including: (1) it is effective even for thick specimens, (2) 'dynamic focusing', (3) ease of using an annular dark field (ADF) mode and (4) linear contrasts. It has become evident that STEM tomography offers significant advantages for the observation of thick plastic specimens. In this study, the technique applied for Cryo-specimens. Of course, even in Cryo-Tomography, the advantages of STEM above mentioned are valid. Because STEM has advantage to resist specimen thickness, it is expected to be powerful method for observing whole cell structure in Cryo-microscopy without thin sectioning.

The insufficient contrast is one of the serious problems in Cryo-electron microscopy. Therefore, the image contrasts by TEM and STEM have to be compared carefully and quantitatively. The result was clear that the STEM image had very low back ground noise. This character can be explained theoretically, there are several reasons; (1) Short operation time for pixel (dual time vs. exposure time), (2) Large physical size of the detector, (3) Very small collection angle (same as very small objective aperture in TEM imaging).

By applying Cryo-STEM tomography, clear membrane structure of organelle appeared without staining and without sectioning.

