

Advanced TEM Navigation Function for High-Throughput Image Acquisition

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In order to effectively observe biological specimens with a TEM, it is essential to utilize procedures including searching target regions in wide field, capturing multiple images of a target structures, and recognizing ultrastructural details of tissues. Enhanced image contrast and reduction of electron beam irradiation damage are additionally important for observing low contrast and beam-sensitive biological specimens. Therefore, to address these needs, the Hitachi HT7800 20-120kV TEM has been developed and new functions integrated.

Utilizing the combination of an objective lens with longer focal length and a smaller objective aperture, the HT7800 was designed with optimization for the biomedical field in mind, specifically to observe low contrast and unstained biological specimens. An integrated high-sensitivity, high-speed CMOS camera enables sample navigation with lower electron beam irradiation, reduced damage, and increased throughput. In addition, improved electron optics allow for image acquisition of an entire grid area and a newly developed image navigation function utilizes this whole grid view to increase speed as well as accuracy of ROI searching.

In this study, we examined the image acquisition workflow in biological tissues from low to high magnifications whereby implementing the Whole View and Image Navigation functions. The Whole View function allows for capture of an entire grid area with a single click of the mouse. The Image Navigation function then utilizes the captured whole view image and allows the operator to search, select areas, zoom in/out, create montages, etc. TEM stage operations and image acquisitions at desired magnification are then executed automatically. The authors anticipate these functions will be very helpful to not only accomplish standardized TEM image acquisitions quicker, but also increase efficiency and imaging quality.

[1] M.Wayama et al., Observation of biological specimens using HT7800 TEM, J.Electr.Microsc.Technol.Med. Biol. In press.