3.8 Factors Determining Image Quality

The following describes the conditions required for a better image quality.

(1) Table 3-1 indicates the relationship between accelerating voltage and image quality. The resolution of the secondary electron image, for example, is generally improved as the accelerating voltage is increased, but the image quality becomes harder and contrast of a specimen surface decreases. Therefore, it is necessary to change the accelerating voltage according to the kind of specimen, etc.

Table 3-1 Relationship between Accelerating Voltage and Image Quality

Accelerating Voltage (kV)	1 2 3 10 15 20 25 30
Resolution	Low ← → High
Charge-up	Little ⇔ Much
Effect by contamination	Large ⇔ Small
Effect by disturbances	Large ⇔ Small
Image quality	Soft ← → Hard
Non-evaporated observation	Easy ⇐
X-ray analysis	X-RAY
Transmitted electron image	STEM
Secondary electron signal	Strong ⇔ Weak

(2) As condenser lens (set with Column Setup) becomes larger, condenser lens current increases and specimen irradiation current decreases.
Table 3-2 indicates the relationship between the current and image quality.

Table 3-2 Relationship between Condenser Lens Current and Image Quality

Condenser lens coarse	1 — 18
Specimen irradiation current (A)	10^{-9} 10^{-10} 10^{-11} 10^{-12} 10^{-13}
Resolution	Low ◄ ► High
Secondary electron signal	Strong ⇦ ⇨ Weak
Roughness of image	Fine ⇦ ⇨ Rough
Secondary electron image	SE
Reflected electron image	RE
Scanning transmission image	STEM
X-ray analysis EDX	EDX
Contamination	Much ⇦ ⇨ Little

(3) Table 3-3 indicates the relationship among opening diameter of objective lens aperture, resolution, specimen current, focal depth and operation mode.

Table 3-3 Relationship between Objective Lens Aperture and Image Quality

Graduations	1	2	3	4
Aperture opening diameter (μm)	100	50	30	20
Focal depth	Shallow — Deep			
Resolution	Low — High			
Specimen current	Large — Small			
Operation mode	X-ray analysis		SE image observation	