Crystal orientation map and grain size analysis using ASTAR with nm resolution

In crystal orientation and phase map, spatial resolution of ASTAR is better than that of SEM-EBSD (Electron Back Scattering Diffraction). Using ASTAR, which has 2 nm resolution, it is possible to analyze fine structure. ASTAR is also called ACOM-TEM (Automated crystal orientation map in TEM) in method mane.

Precession electron diffraction (PED)

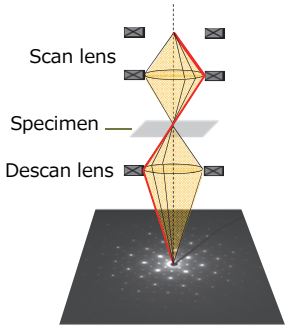

Fig.1 : PED

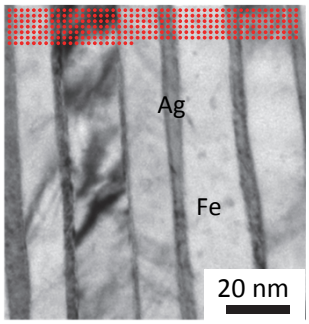

Fig.2 : Measured points in TEM image

In PED, a tilted incident electron beam is rotating along the surface of the cone as shown Fig. 1. By integration of diffraction condition with respect to incident direction, diffraction spots in higher scattering angle can also be detectable. Therefore, PED pattern is more suitable to determine crystal structure and orientation of the sample than conventional TEM.

The feature of ASTAR

Table 1 : Resolution of crystal orientation map

	Spatial resolution	Angle resolution	Other characteristics
ASTAR	**2 nm**	2.0°	Identification of more kinds of crystal
t-EBSD	20 nm	0.5°	—
r-EBSD	50 nm	0.5°	Combined analysis with EDX

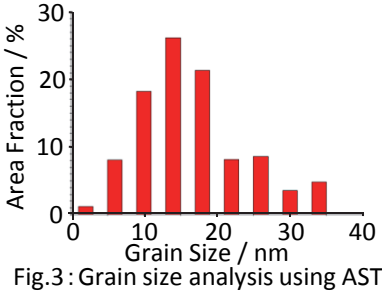

Fig.3 : Grain size analysis using ASTAR

ASTAR has high spatial resolution and low angle resolution in the evaluation of crystal orientaion, compared to SEM-EBSD.

Characterization of Fe / Ag multilayer by ASTAR

The spatial distribution of crystal phases and orientation was characterized by ASTAR. Measured step size was 0.8 nm. Phase and crystal orientation maps with spatial resolution of 3 nm were obtained.

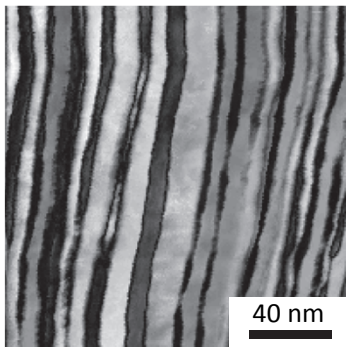

Fig.4 : Reconstructed BF-STEM image

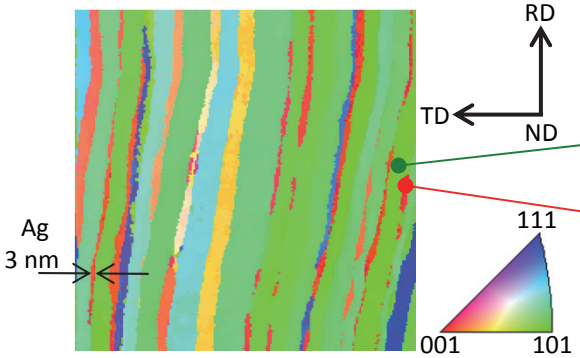

Fig.5 : Crystal orientation Map (ND)

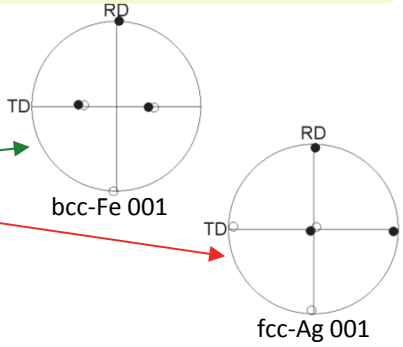

Fig.6: Crystal orientation (pole Figure)

Fig.7: Phase map

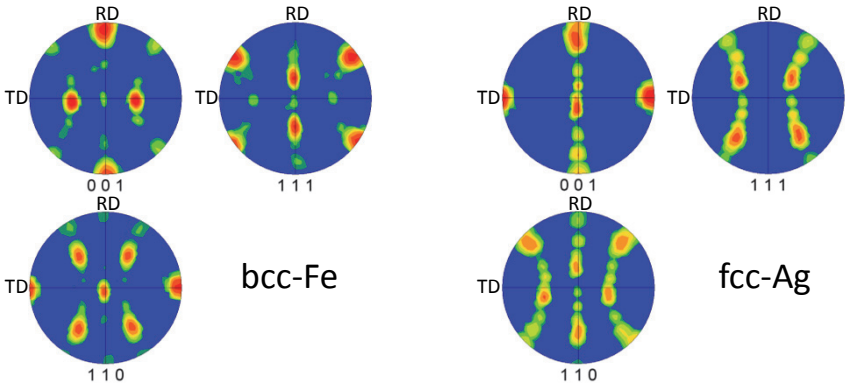

Fig.8: Crystal orientation in all area (pole figure)