# Stacking faults in 4H-SiC single crystal observed by grazing incident SR X-ray topography

Hirofumi Matsuhata, and Hirotaka Yamaguchi
National Institute of Advanced Industrial Science and Technology,
1-1-1, Umezono, Tsukuba, Ibaraki, 305-8568, Japan

We have been utilizing grazing incident X-ray topography to observe lattice defects in 4H-SiC epitaxy films as well as inside power devices using monochromatic X-ray obtained from synchrotron radiation. Very characteristic contrast can be observed by this method for basal plane dislocations depending on whether they are C-core or Si-core dislocations. In this report, we will show some cases that positions of Shockley-type stacking faults can be determined in the stacking sequence of basal-planes "ABAC" in 4H-SiC crystal.

The experiment was carried out at BL-15C in Photon Factory. Monochromatisation was carried out by two Si111 crystals. The reflection $\bar{1}\ \bar{1}\ 28$ at $\lambda$=0.15nm was used.

Figure 1 shows triangles hemmed with dark lines lining along a dark basal plane dislocation with **b**=1/3[$\bar{1}\ \bar{1}$ 20]. According to previous our experiment the dark contrast of dislocations was discussed to be C-core dislocation on a basal plane, thus the triangles indicate the stacking fault surrounded by C-core Shockley-type partial dislocations. Figure 2 (a) shows an illustration model of the stacking fault surrounded by C-core Shockley-type partial dislocations. A model of Shockley-type partial dislocations and stacking faults for the cases that they are located at "/" in the stacking sequence of the A/BAC or ABAC/ are illustrated in Figure 2 (b). The model in Fig. 2 (a) can exist in the dislocation loop illustrated in Figure 2(b) at A/BAC or C/ABA, but neither at AB/AC nor ABA/C. Thus, we concluded those stacking faults are at A/BAC or C/ABA.

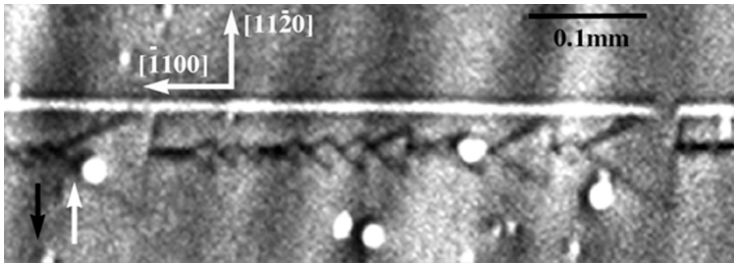


Fig.1 Observed stacking faults with dark partial dislocation.

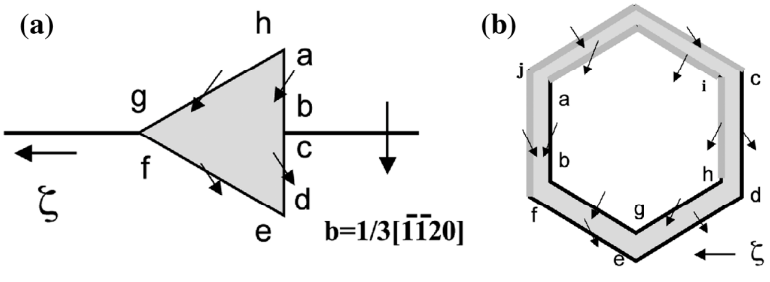


Fig.2 (a) Model of stacking fault observed above. (b) Dislocation loop model. Dark line indicates C-core, gray line indicates Si-core dislocation.