Investigations of Triangular Inclusions in 4H-SiC Epilayers on 4H-SiC Single Crystal Substrates: (I) Identification of Phases *	X19C

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In the case of 4H-SiC epitaxial growth on (0001) substrates, one of the big obstacles is the occurrence of triangular inclusions in the epilayer. In this study, Synchrotron White Beam X-ray Topography (SWBXT) and Nomarski Optical microscopy (NOM) have been used to study the character of these triangular inclusions. The 4H-SiC substrates used are misoriented by 3.5° from (0001) toward <11$\bar{2}$0>. It has been revealed by analysis of X-ray diffraction patterns that there are two additional phases, 3C(I)-SiC and 3C(II)-SiC, present in the 4H-SiC epilayer[1]. The detailed correlation between the NOM micrograph and reflection topographs is shown in Figures (a) to (d). Evidently, all triangular inclusions belong to one or the other of the two 3C-SiC structural configurations. Most of the triangular inclusions are single crystal 3C-SiC, although they appear to be severely strained. There is only one triangular inclusion consisting of both 3C(I) and 3C(II)-SiC, which implies the existence of a double position boundary (DPB) within the inclusion[2]. Therefore it is unambiguous that those triangular defects in 4H-SiC epilayers studied are 3C-SiC inclusions.

1. W. Si *et al*, 1995 NSLS Annual Activity Report, p. B-173.
2. H. S. Kong *et al*, J. Mater. Res., Vol. 4, No. 1, (1989), p. 204.

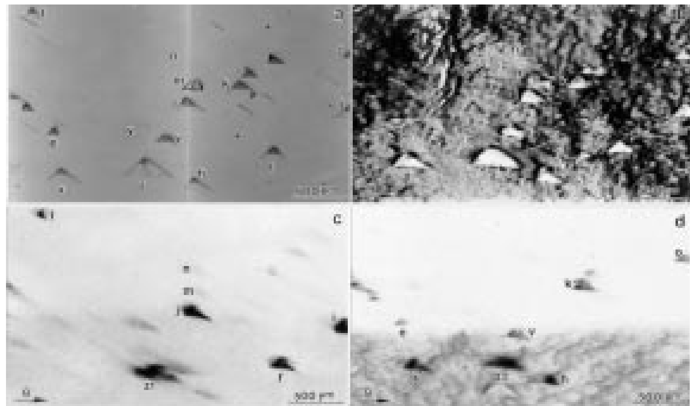

Figure 1. 4H-SiC epilayers on 4H-SiC substrates misoriented by 3.5° from (0001), (a). a NOM micrograph, (b). the reflection topograph from the same region, 4H-SiC, g = 1$\bar{1}$06, λ = 0.78 Å , (c). the reflection topograph of 3C(I)-SiC, g = 202, λ = 0.91 Å , and (d). the reflection topograph of 3C(II)-SiC, g = 131, λ = 0.67 Å.

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