

SiC 溶液法 C 面成長における TSD 変換 TSD conversion on C face during solution growth of SiC

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Introduction: Solution growth of SiC attracts great attention because of its potential to achieve high quality crystal. We have reported high quality SiC growth through the conversion of threading screw dislocations (TSDs) to stacking faults (SFs) [1]. Recently, many researchers have tried to grow bulk SiC crystals on the C face by the solution growth because of the polytype stability and the long time growth [2]. However, in our previous research, the TSD conversion was hardly observed on the C face [3]. The formation of macrosteps on the growth surface has considered to be attributed to the TSD conversion [4]. Therefore, in the present study, we investigated the conversion behavior on the C face with different surface morphology.

Experimental: 4H-SiC crystals were grown by top-seeded solution growth method using pure Si and Si-5at%Ti solution respectively. $[11\bar{2}0]$ off-oriented C-face 4H-SiC were used as seed crystals. The growth was conducted at 1700°C for 1 hour. Nomarski microscopy, laser microscopy and X-ray topography were performed to characterize the grown crystals.

Results and Discussion: Fig. 1 shows Nomarski images of the grown crystal. The surface of the grown crystal using pure Si was very smooth, while the macrosteps were often observed on the surface of the grown crystal using Si-Ti solution. Fig. 2 shows X-ray topography images of the grown crystal. In the grown crystal using pure Si (Fig. 2(a)), TSDs, TEDs and BPDs were observed as marked A, B and C respectively, while the knife shaped contrasts corresponding to SFs were hardly observed. On the other hand, in the grown crystal using Si-Ti solution (Fig. 2(b)), SFs converted from TSDs were observed as marked D. This indicates that even on the C face, the TSD conversion evidently takes place by the formation of macrosteps on the growth surface.

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References:

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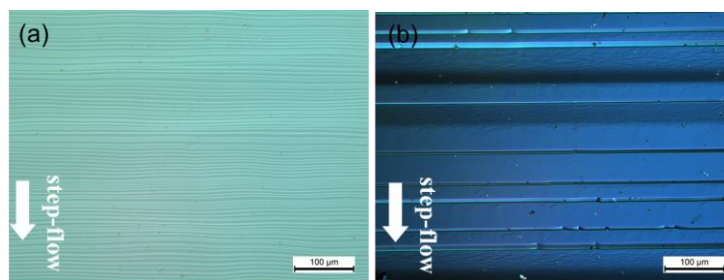


Fig.1. Nomarski images of the grown crystals using (a) pure Si and (b) Si-Ti solution on the C face.

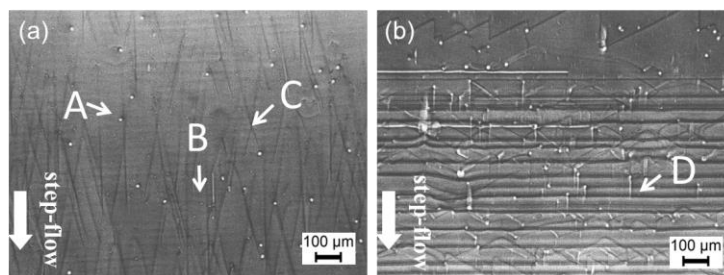


Fig.2. X-ray topography images of the grown crystals using (a) pure Si and (b) Si-Ti solution on the C face.