

Abstract for IBMM2016 submitted by S. Momota

- Title : Fabrication of multi-step structure on SiC surface by sequential irradiation of Ar beam
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- Abstract: In a series of previous experiments, a swelling structure, which is fabricated by means of ion-beam induced expansion effect, has been observed in crystal material. Even for SiC crystal, which is one of hopeful ultrahard materials, the swelling effect was clearly observed ([1], [2]). The object of the present study is to fabricate a multi-step structure on SiC crystal by applying the ion-beam induced swelling effect. In addition, a depth profile of mechanical properties of fabricated structures is investigated. Ar beam was irradiated on 6H-SiC and a swelling height was observed as a function of the fluence by a profilometer. The swelling height linearly increased with a fluence of Ar beam. In the case of 700 keV, the swelling height reached 100nm at the fluence of  $10^{15} / \text{cm}^2$ . Based on the results, two-step irradiation of Ar beam on 6H-SiC was performed. Parameters and areas of two independent irradiation were different for each other. Part of two areas was overlapping. Two-step structure has been successfully fabricated by the two-step irradiation. In the fluence region where the linear response was observed, the swelling height of the overlapping area was consistent with the sum of those induced by single irradiation. In the fluence region, where the swelling effect of SiC is obvious, the deterioration in observed mechanical properties was relatively small. This result indicates that swelling structures would be suitable for mechanical use.

## References

- [1] Y. Katoh, H. Kishimoto, A. Kohyama, Materials Transactions (2002) 42:612-616.
- [2] M. Ishimaru, I.T. Bae, A. Hirata, Y. Hirotsu, Phys. Rev. B (2005) 72:024116.