ESRF	**Experiment title:** X-ray topography of 3C-SiC thin films grown on 6H-SiC substrates	**Experiment number**: HS-884
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Report:

The aim of our experiments was to characterize 3C-SiC thin films grown on 4H-SiC substrates by means of the high-resolution plan wave X-ray topography. It should be demonstrated that the thin film is comprised of rotational twin-crystallites. Furthermore, the spatial distribution and the size of those twins should be determined. Previous X-ray diffraction studies [1] revealed a small difference ($\Delta c/c \approx 8 \bullet 10^{-4}$) between the c-lattice parameter of the epitaxially grown 3C-SiC thin film and the cristalline 6H-SiC substrat. Hence, by using a well collimated and monochromated X-ray beam, it should be possible to obtain plan wave topographs produced by the thin films only (with the inherent rotational twin domains) without any disturbing influence of the substrate.

In order to compensate the sample-bending caused by the thin film preparation, we used the experimental set-up with the new bent X-ray collimator-monochromator of ID 19. In this way, high quality (sharp and contrastful) X-ray topographs of the 4H-SiC substrates (Fig. 1), could be obtained. However, we could not achieve the same quality in the 3C-SiC thin film topographs due to the high incoherent background noise compared with the diffracted intensity of the thin film. This experimental fact caused two major experimental problems. First, the determination of the correct position of the thin film reflection. Second, recording a high quality topograph at long exposure times with the high background noise. The high back ground noise is inherent to the fact that the bend is located within the experimental hutch. For the future we like to draw two important conclusions. First, a successful investigation of our samples requires an experimental set-up with the collimator-monochromator outside the experimental hutch, whereas this collimator-monochromator needs not to be bent. Second, the high quality of the substrate topographs promise a successful investigation of the thin film if the background can be reduced with an different experimental setup at ID19.

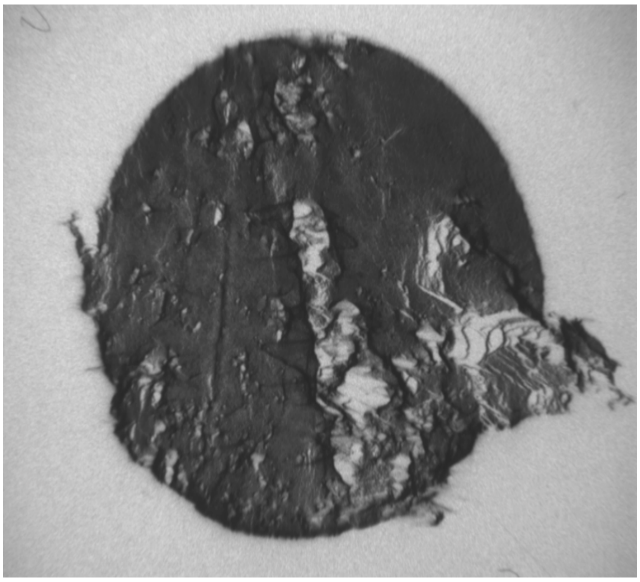

Fig. 1: Asymmetric 10.9-reflection topograph of the 4H-SiC wafer. The sample oscillating has compensated the wafer bending.

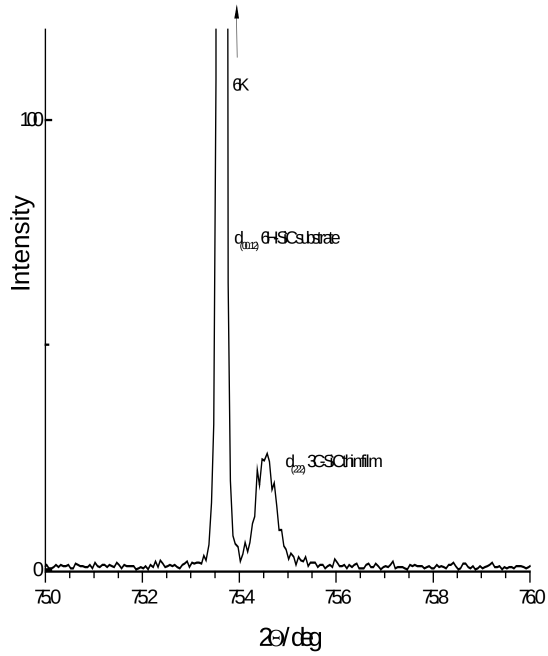

Fig. 2: X-ray diffractogram of the 3C-SiC thin film (≈1µm) on 4H-SiC wafer demonstrates the intensity ratio

[1] Bauer, A., Kräußlich, J., Köcher, B., Goetz, K., Fissel, A., Richter, W.: Materials Science and Engineering B61-62 (1999) 179