Origin of a fourfold symmetric (0006) Bragg diffraction intensity in φ-scan mode on a 6H-SiC crystal

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Abstract

The quality of Silicon carbide (SiC), when used as a substrate, has profound effects on growth of the homo/hetero-epitaxial film on it. Here, a fourfold symmetric (0006) X-ray diffraction intensity in an φ-scan mode is found, no matter for a double-sides polished 6H-SiC wafer or a thick 6H-SiC slice, nothing to do with the deformation of wafers or the existence of mosaic domains. The experimental results show that both of the diffraction intensity and its full width at half maximum as a function of azimuth angle φ exhibit the features of four peaks and four valleys regularly. By measuring the bending of the diffraction planes along the azimuth angles at the peaks and valleys, saddle shape deformed (0001) atomic planes of the 6H-SiC in macroscopic scale are supposed. Based on the hypothesis, a model analysis on the diffraction intensity matched well with the observed anisotropic fourfold symmetric X-ray diffraction in 6H-SiC single crystal.