Supplementary Material

van der Waals epitaxial growth of bismuth thin-film on silicon (111) substrate by MBE

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1. XRD configurations for measuring tilting Si (220) plane

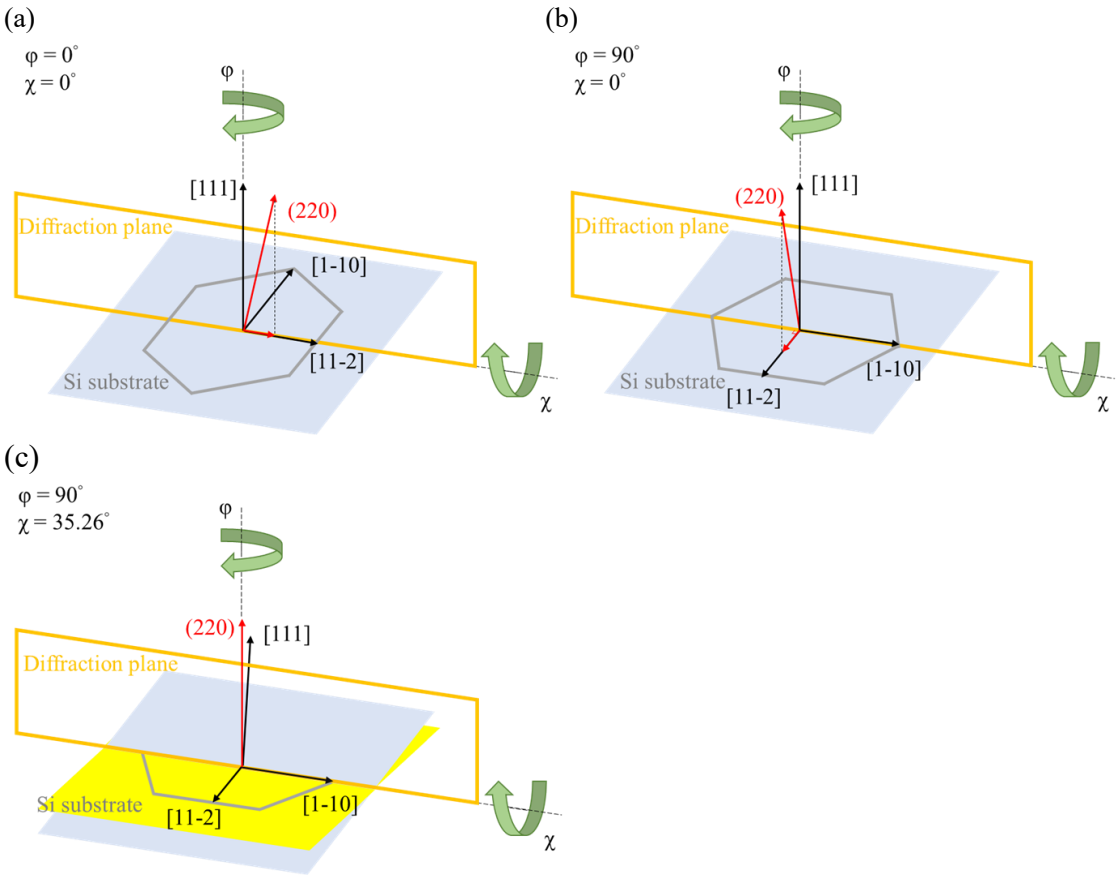

Figure S1. (a) Schematic diagram of the HRXRD configuration when φ angle is at 0°. The [11-2] of the Si substrate parallel to the diffraction plane. (b) For the measurement of Si (220) planes, the sample was rotated to φ = 90°. The projection of (220) plane normal on the sample surface is perpendicular to the diffraction plane. (c) (220) plane was tilted with a χ angle to let its normal on the diffraction plane to perform ω-2θ scan. Here χ angle is 35.26°, referred to the angle between Si (111) and (220) plane normal. XRD measurements for Bi (01-14), (10-15) and (11-26) plane follow same procedures.

2. Relation between XRD φ-angle and in-plane Si (111) substrate direction

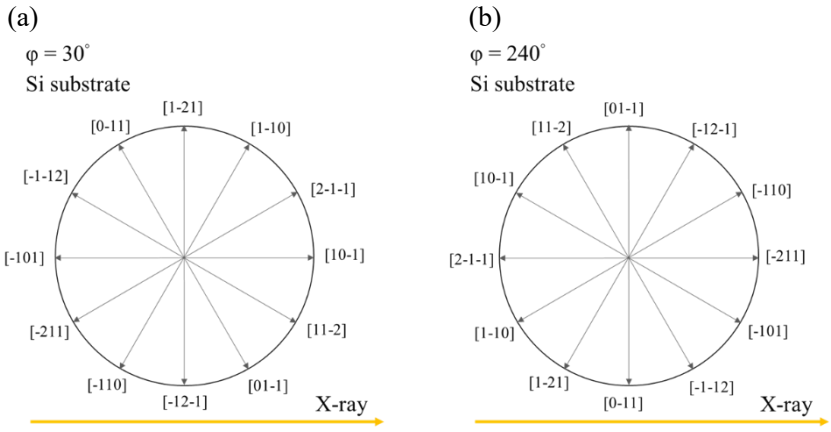

Figure S2. Schematic top view of Si (111) substrate in-plane direction when φ angle is at (a) 30° and (b) 240°. X-ray beam direction is indicated by yellow arrow. Si substrate direction is determined by the primary orientation flat on the wafer and also supported by XRD Si (220) scan.