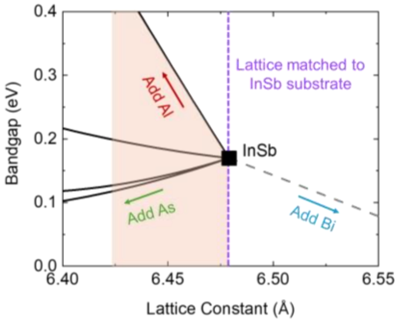

Figure 1: Bandgap versus lattice constant plot focused around InSb, where the red, green, and blue arrows show the band bowing to AlSb, InAs, and InBi respectively. The purple dashed line shows where the alloy is lattice matched to InSb, and the pink enclosed area shows the appropriate barrier space for AlInSbBi.

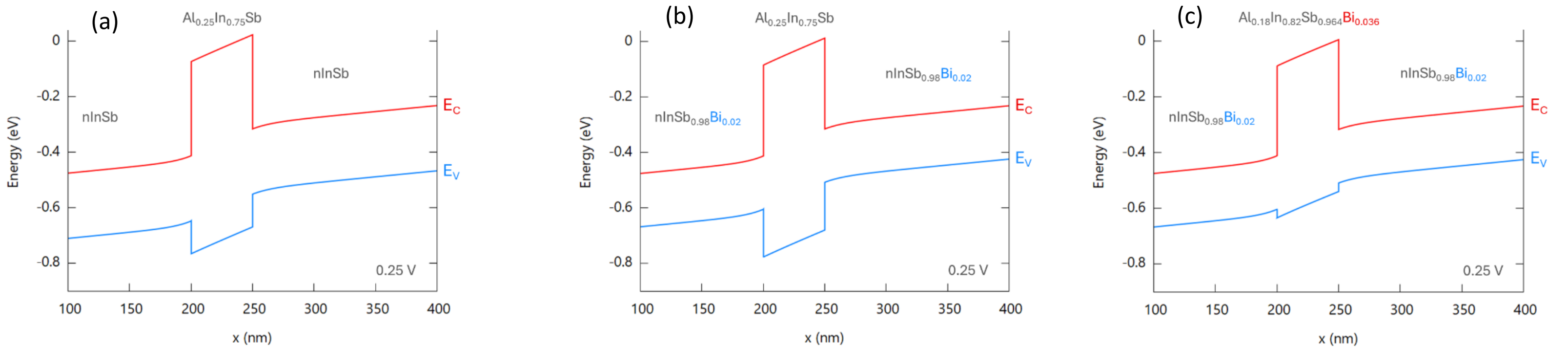

Figure 2: Biased Poisson-Schrödinger simulations of (a) an InSb-based LWIR nBn structure with InSb cap and absorber layers with light n-type doping (note: InSb cannot access the LWIR), where the AlInSb barrier layer provides a conduction band offset that blocks majority electrons, and the undesirably large valence band offset negatively impacts device performance, (b) nBn with InSbBi cap and absorber layers, where the addition of Bi into InSb enables LWIR detection, and the AlInSb barrier layer, where both the majority electrons and minority holes are blocked, and (c) nBn with InSbBi cap and absorber layers, and incorporating Bi into the AlInSb barrier layer improves the nBn structure by decreasing the valence band offset and minimally affecting the desired conduction band offset.

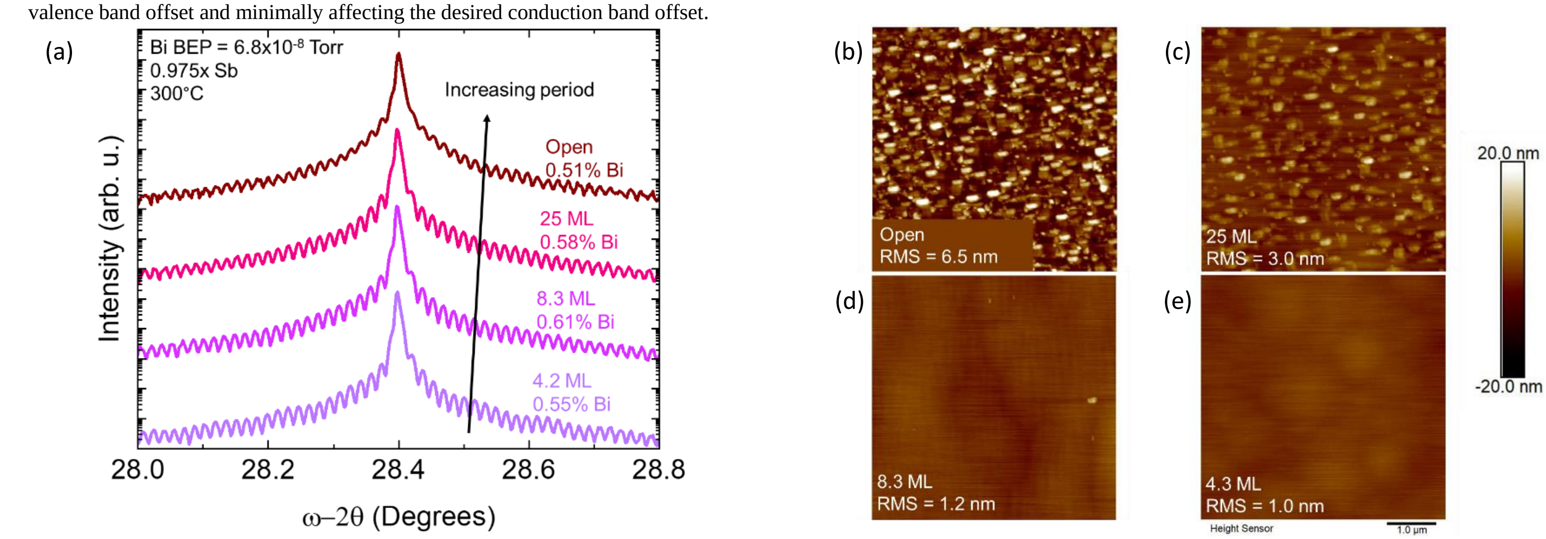

Figure 3: (a) ω-2θ scans of InSbBi films grown at 300°C under a 0.975x Sb/III flux ratio, where a Bi BEP of 6.8x10^{-8} Torr was maintained. The flux was modulated via shuttering from 4.2 ML to 25 ML (for 7.5 ML - 45 ML periods), and XRD simulations show similar Bi incorporation was achieved for all films; AFM scans (b-e) reveal droplets occurred in films grown for 25 ML and under a constant flux, while smooth surfaces were achieved at shorter modulation periods.

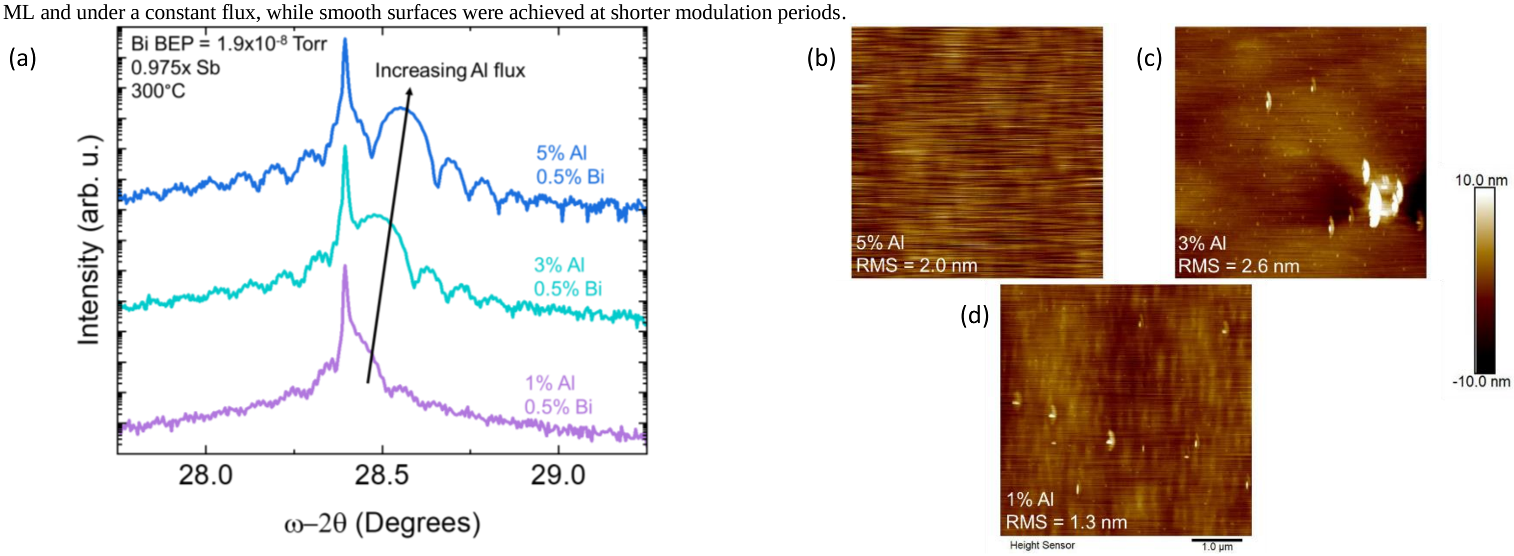

Figure 4: (a) ω-2θ scans of AlInSbBi films grown at 300°C under a 0.975x Sb/III flux ratio, where a constant Bi BEP of 1.9x10^{-8} Torr was maintained, and the Al concentration was swept from 1-5% Al. The XRD simulations show that similar Bi incorporation was achieved for all films; AFM scans (b-d) show relatively smooth surfaces for all films, indicating the upper limit for Bi incorporation was not reached.