**Lattice Accommodation on Hetero- and Homoepitaxial Systems: Bi/Si(001) and Bi/Bi(111)**

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**Motivation**
- Intriguing electronic properties (very large Fermi wavelength and long scattering mean free path), small carrier effective mass $m^*$ are key for Bi to be a perfect choice to study electrical and magneto-transport properties on it.
- Important material for spintronics due to having very long spin diffusion length $\lambda_s$.

**Methods and Techniques**
- In situ surface morphology by Spot Profile Analysis Low Energy Electron Diffraction (SPA-LEED).
- Ex situ film analysis by Atomic Force Microscopy (AFM).

**Formation of Dislocation Network**
- Lattice accommodation by the formation of dislocation network during annealing to 450 K.
- Strain state on the interface.
- Extend up to the surface and build-up periodic surface height undulation.
- Electron undergoes small phase shift resulting spot splitting in LEED.
- Lattice constant increases until the film relaxes.

**Quantitative analysis of Dislocation Network**
- Relative integral intensities of all orders of satellites spots of (00)-spot were measured and drawn with scattering phases.
- A general equation (7) given below was used to generate a wave like 1-dim height undulated surface and simulated to get LEED spots at different scattering phases.

**Bi on Bi(111)/Si(001) @ 80 K**

**Roughness characterization**
- In situ observation of (00)-spot profile during deposition.
- The lateral roughness, FWHM of shoulder increases to maximum at half bilayer and recovers again after completing bilayer flatness at bilayer growth mode.
- During deposition, island density increases and reaches maximum at half bilayer.
- The vertical roughness, $G(h)$ curve shows parasitic dependence with coverage in a single bilayer as predicted by theory $[9]$.

**Bi on Bi(111)/Si(001) @ 450 K**

**Roughness characterization**
- Vertical roughness has been determined through the $G(h)$ curve $[9]$.
- $G(h)$ curves were plotted for different thicknesses $d$ i.e., 4.5, 7.5 and 12.5 Bls respectively.
- Almost constant RMS roughness i.e., 0.5 Bls was measured.