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The Electronic Properties of Nanoscale Meta-lattice Made by High Pressure CVD ZHAOHUI HUANG, VINCENT CRESPI, Pennsylvania State University — Meta-lattice can be defined as an artificial 3D superlattice with periodic structural modulation occurred at 10nm scale. One viable route to synthesize can be as follows: A template is first prepared by close-packed nanometer-sized silica spheres, then Si/Ge or a binary semiconductor is infiltrated into voids by high pressure chemical vapor deposition (CVD). Later silica spheres can be removed by chemical method, and voids in the inverse meta-latice offer the opportunity for a second infiltration. Due to the characteristic length of voids, meta-lattice provides a platform to test novel mesoscopic electronic and thermal phenomena. A meta-lattice solid can show novel physical properties that each constituent infiltrate material does not have. Since a significan portion of atoms are located on the surface, the interface structure details are expected to play a critical role. Here we investigate Si/Ge inverse meta-lattices with or without silica template present. Tight-binding, DFT and GW/BSE techniques are employed to look into the electronic and optical properties.

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