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Atomic Layer Epitaxy of Si and Ge on Si(100)-(2x1) JEAN-FRANCOIS VEYAN, HEESUNG CHOI, M.S.E Department, University of Texas at Dallas, Richardson, Texas 75080, USA, JOSHUA BALLARD, Zyvex Labs, Richardson, Texas 75081, USA, STEPHEN MCDONNELL, WILEY P. KIRK, ROBERT M. WALLACE, M.S.E Department, University of Texas at Dallas, Richardson, Texas 75080, USA, JOHN RANDALL, Zyvex Labs, Richardson, Texas 75081, USA, KYEONGJAE CHO, YVES J. CHABAL, M.S.E Department, University of Texas at Dallas, Richardson, Texas 75080, USA — Atomic Layer Epitaxy of Si and Ge on Si(100) surface using disilane (Si_2H_6) and digermane (Ge_2H_6) as precursors is a critical step for constructing 3-D nano-structures, and is indispensable for Atomically Precise Manufacturing of new devices such as quantum dots. Using IRAS and STM together with DFT calculations, we show that Si_2H_6 chemisorbs on clean Si(100)-(2x1) via beta-hydride elimination pathway, involving the intermediate states Si-H and Si-SiH_2-SiH_3. Thermal decomposition of the chemisorbed Si_2H_5 leads to the formation of Si_2H_2 as an added dimer rotated 90 degrees with respect to the initial dimer row. A similar chemisorption pathway is observed for Ge_2H_6 on Si(100)x(2x1). The thermal decomposition of Ge_2H_5 involves the migration of H from Ge to Si, and Ge ad-dimer formation. Evidence for Ge epitaxial growth on Si(100)x(2x1) using Ge_2H_6 will be presented.

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