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Low temperature epitaxial growth of Ge on Si(100)-(2x1) with excitation laser by pulsed laser deposition ALI ER, HANI ELSAYED-ALI, Old Dominion University — Low temperature epitaxy is important for Ge-Si device fabrication because it can lead to suppressing the introduction of defects such as dislocations and staking faults**.** The effect of laser-induced electronic excitations on the self-assembly of Ge quantum dots (QDs) on Si(100)-(2x1) grown by pulsed laser deposition is studied. The experiment was conducted under a pressure $\sim$1x10^{-10} Torr. A Q-switched Nd:YAG laser (λ = 1064 nm, 10 Hz repetition) was split into two beams; one used to ablate a Ge target while the other to electronically excite the substrate. *In-situ* reflection high-energy electron diffraction (RHEED), scanning tunneling microscopy (STM), and *ex-situ* atomic force microscopy (AFM) were used to study the morphology of the grown QDs. It was observed that excitation laser reduces the epitaxial growth temperature to 250 $^\circ$C. Applying excitation laser to the substrate during the growth changes the QD morphology and island density, also enhances epitaxy, and improves the size uniformity of QDs at 390 $^\circ$C and decreases the surface roughness at room temperature. A purely electronic mechanism of enhanced surface diffusion of the Ge adatoms due to a phonon kick following two hole localization could explain the results. Ongoing experiments using a femtosecond laser for excitation and *in-situ* STM for detection of the early stages of island nucleation will be presented.

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