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Nonthermal Laser Assisted Ge Quantum Dot Formation on Si(100)-2x1 by Pulsed Laser Deposition ALI ER, Department of Physics, Old Dominion University, HANI ELSAYED-ALI, Old Dominion University Applied Research Center — 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 samples were cleaned by using modified Shiraki method and then transferred into the deposition chamber. The vacuum system was then pumped down, baked for at least 24 hours, and the sample was then flashed to 1200 $^\circ$C in order for the 2x1 reconstruction to form. The experiment was conducted under a pressure $\sim$1x10^{-10} Torr. A Q-switched Nd:YAG laser was used to ablate a Ge target. In-situ RHEED and STM and ex-situ AFM were used to study the morphology of the grown QD. The dependence of the QD morphology on substrate temperature and ablation and excitation laser energy density was studied. Electronic excitation is shown to affect the surface morphology. Laser irradiation of the Si substrate is shown to decrease the roughness of films grown at a substrate temperature of $\sim$400 ^{o}C. Electronic excitation also affected the surface coverage, cluster density, uniformity and decreased the temperature required to form 3-dimensional QDs to $\sim$250 $^\circ$C at which no crystalline film formation is possible without excitation laser. Possible mechanisms such as two hole localization following the phonon kick will be discussed.

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