

Hot Electron Energy Loss Rate in Two-Dimensional SiGe Heterostructure

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Abstract: *We study the hot electron energy-loss rate (ELR) induced by acoustic phonons and optical phonons, in two-dimensional SiGe quantum wells, including the screening effect and hot-phonon effect. At the low-temperature regime, the ELR is found to be dominated by acoustic phonons and at higher temperature ELR is dominated by optical phonons. The unscreened longitudinal acoustic (LA) phonon due to deformation potential (DP) coupling is dominant over the other screened acoustic phonon contributions. At higher temperatures, there is a crossover from ELR due to LA phonons to ELR due to longitudinal optical (LO) phonons with the cross-over temperature being about $T_c \sim 40K$. The ELR without hot phonon effect in LO phonon scattering is studied. The LA phonon screening effect and hot phonon effect is demonstrated to reduce ELR significantly.*

Keywords: energy loss rate, acoustic phonons, optical phonons, screening effect, hot phonon effect, SiGe, heterostructure

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