

## Many-Body Effect on Optical Gain of n+ Doping Tensile-Strained Ge/GeSiSn Quantum Wells

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**Abstract :** The many-body effect on band structure and optical gain of n+ doping tensile-strained Ge/GeSiSn quantum wells are investigated by using an 8-band  $k \cdot p$  method. Phase diagram of Ge/GeSiSn quantum well is obtained. The E-k dispersion curves, band gap renormalization and optical gain spectra including many-body effect will be calculated and discussed. We find that the  $k \cdot p$  method without many-body effect will overestimate the optical gain and transition energy.

**Keywords :** Si photonics, many-body effect, optical gain, Ge-on-Si, Quantum well

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