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Spin-Polarized Luminescence Across the Indirect Band-Gap of Strained Ge, Si and Their Alloys[1] DHARA TRIVEDI, Department of Physics & Astronomy, University of Rochester, PENGKE LI, HANAN DERY[2], Department of Electrical and Computer Engineering, University of Rochester — We study optical orientation and circularly polarized photoluminescence in germanium, silicon and their alloys. We focus on phonon-assisted optical transitions across the indirect band-gap under conditions of biaxial strain (either compressive or tensile). The signature of strain on the band structure and phonon dispersion is observed in the luminescence spectra where spin properties are better resolved from the change in intensity ratio between left and right circularly polarized emission. The spectra is simulated using the combined results of a spin-dependent empirical pseudopotential method, adiabatic bond charge model, electric-dipole approximation, and rigid-ion model. An additional strain tensor has been introduced in calculating the strain effect. We have used group theory extensively to account for all possible transitions and to provide concise selection rules.

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