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Gain-Induced Refractive Index Changes in Resonantly Pumped Optical Pumping Injection Cavity Lasers LINDA OLAFSEN, LAUREN BAIN, LAUREN ICE, BEN BALL, Baylor University — An optical pumping injection cavity (OPIC) laser contains a type-II W active region enclosed between two GaSb/AlAsSb distributed Bragg reflector mirrors, where the thickness of the etalon cavity surrounded by the mirrors is tuned to the desired pump wavelength. Multiple reflections of the pump photons result in more efficient absorption of the pump beam and consequently higher efficiencies and lower lasing thresholds. An optical parametric oscillator is used to pump the OPIC lasers at resonance, where the threshold pump intensities are minimized and output efficiencies are maximized. The resonant pump wavelength is found to vary quadratically with temperature, not linearly as would be expected from temperature-dependence of the lattice constant and refractive indices. Possible sources of this nonlinearity are lattice heating and gain-induced changes in the refractive indices resulting from the increase of optical pumping intensity with temperature. Through spectral measurements using step-scan Fourier Transform Infrared spectroscopy and multilayer reflectivity modeling, the relative contributions of these possible sources of parabolic temperature dependence of resonant wavelength are investigated.

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