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Valence-band Mixing in Strain-based Traps for Indirect Excitons in Coupled Quantum Wells[1] JEFFREY WUENSCHELL, NICHOLAS SINCLAIR, DAVID SNOKE, University of Pittsburgh, LOREN PFEIFFER, KEN WEST, Princeton University — Excitons in a coupled quantum well system under an applied bias are spatially separated, with electrons and holes in opposite wells. The pair can interact via the Coulomb interaction, but recombination is suppressed. Indirect excitons exhibit a long (up to tens of microseconds), tunable lifetime and are of interest to those studying high density excitonic phase transitions in equilibrium. Recent experiments have revealed sharply temperature- and density-dependent transitions in the luminescence pattern of strain-trapped indirect excitons [1]. Localized strain shifts the valence and conduction bands, creating a trap for the case of hydrostatic stretching [2]. Two factors differentiate this technique from electrostatic traps, the splitting between the light- and heavy-hole exciton states varies with stress and the presence of shear strain modifies the symmetry of the ground state. Due to strong dependence of the radiative lifetime on the tunneling rate, the indirect heavy- and light-hole excitons have drastically different recombination rates; meaning that mixing sharply alters the luminescence pattern. We will discuss the modeling of the structure of the single-particle potential and the role that interband mixing plays in the appearance of high density phase transitions.

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