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Absorption spectroscopy of quantum dot molecules DANNY KIM, Naval Research Laboratory, M.F. DOTY, University of Delaware, M. BASHKANSKY, M. SCHEIBNER, A.S. BRACKER, D. GAMMON, Naval Research Laboratory — The energy levels of a vertically-coupled self-assembled InAs/GaAs quantum dot pair are probed using differential transmission spectroscopy. This technique offers very fine spectral resolution ($< 0.1\ \mu eV$) allowing us to resolve the linewidths and fine structure for the various energy levels found in the rich spectrum of coupled quantum dots. For example, we observe increased broadening of the neutral exciton as it approaches the anticrossing point, as a result of a non-zero tunneling term well away from resonance. Excitons particular to coupled dots —i.e. a positive trion/biexciton, where the additional hole is on the spectator dot— exhibit polarization and power-dependent behavior that is in marked contrast to their single dot counterparts. Finally, the occupation of these exciton states are manipulated by using a second laser that is resonant on a related energy level. These experiments are a crucial step in using these molecules for coherent nonlinear optical processes.

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