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Selective occupation of conduction band valleys in AlAs quantum wells. MEDINI PADMANABHAN, K. VAKILI, Y.P. SHKOLNIKOV, O. GUNAWAN, T. GOKMEN, E. TUTUC, E.P. DE POORTERE, M. SHAYEGAN — We report our progress in the controlled and selective occupation of various conduction band minima in AlAs quantum wells and the corresponding magneto-transport behaviors. AlAs has three conduction band minima, or valleys, located at the X-points of the Brillouin zone. By a suitable choice of well width and in-plane stress, these minima can be occupied by two-dimensional electrons singly or in various combinations. We review the factors that determine the valley occupation and show how we have used them to produce a variety of systems with different valley occupations. In particular, we will discuss two methods that we have successfully used: (a) using a piezoelectric material to impart uniaxial strain and, (b) using a material with a different thermal expansion coefficient than our samples to impart biaxial tensile strain.

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