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Limits of doping $In_{0.53}Ga_{0.47}As$ with Si and Be SANGEETHA VIJEYARAGUNATHAN, TETSUYA D. MISHIMA, MICHAEL B. SANTOS, University of Oklahoma — We report on a study of doping efficiency in $In_{0.53}Ga_{0.47}As$ layers grown on InP (001) substrates by molecular beam epitaxy. Si and Be effusion cells were used to provide n- and p-type dopants, respectively. In epilayers grown at 0.63 monolayers per second with a substrate temperature of 500 $^\circ$C, doping cell temperatures below T_{Si}=1260 $^\circ$C (T_{Be}=907 $^\circ$C) resulted in electron (hole) concentrations that followed an Arrhenius relation with an activation energy of 5.0 eV (4.0 eV). At higher cell temperatures, the carrier concentration saturated at approximately n=3.1×10^{19}cm^3 (p=2.6×10^{19}cm^3). For T_{Si}=1300 $^\circ$C (T_{Be}=928 $^\circ$C), the carrier concentration was increased to n=4.2×10^{19}cm^3 (p=3.3×10^{19}cm^3) through use of a lower substrate temperature of 400 $^\circ$C (470 $^\circ$C). The maximum carrier concentration achieved through lowering the substrate temperature was n=4.8×10^{19}cm^3 (p=9.1×10^{19}cm^3). For Be doping, the maximum hole concentration was increased to 1.3×10^{20}cm^3 by using a lower growth rate. We will compare our results with the doping of GaSb and InAs, and discuss attempts to increase the maximum concentration through delta-doping and migration enhanced epitaxy.

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