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Valence Band Anticrossing in $GaBi_xAs_{1-x}$ KIRSTIN ALBERI, O.D. DUBON, U.C. Berkeley, Berkeley CA, 94720,; Berkeley Lab, Berkeley CA, 94720, W. WALUKIEWICZ, K.M. YU, Berkeley Lab, Berkeley CA, 94720, K. BERTULIS, A. KROTKUS, Semiconductor Physics Institute, A. Gostauto 11, Vilnius LT 01108, Lithuania — Recently, significant attention has been devoted to exploring the large bandgap bowing and spin-orbit splitting in $GaBi_xAs_{1-x}$. alloys. We attribute the origins of these effects to a restructuring of the alloy valence band induced by an anticrossing interaction between the delocalized GaAs p-like states and the resonant localized Bi p-like states. Hybridization of like-symmetry states leads to the splitting of the heavy hole, light hole and spin-orbit split-off bands into sets of E_+ and E_- subbands. The splitting is confirmed experimentally by photomodulated reflectance spectroscopy in alloys with Bi concentrations up to $x = 0.084$. The bandgap bowing is a direct consequence of the strong upward shift of the uppermost heavy and light hole E_+ bands with increasing Bi concentration, while the much slower ascent of the spin-orbit split-off E_+ band produces the large rise in the spin-orbit splitting energy.

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