character and the second band has $|y'\rangle$-like character. The energy separation (ΔE) is defined as the difference of these two topmost valance subbands at the Γ point. Figure 6 presents the ΔE for both InGaN bulk and QW (3 nm) structures on semipolar $(30\bar{3}1)$ GaN substrates with different indium compositions. The energy separation increases with increasing indium compositions in both bulk material and the QW structures, suggesting that the strain is the dominate factor in determining the degree of energy separations and associated optical polarizations. This is consistent with the experimental data (Fig. 3(b)). The difference between the bulk and QW results is however very small (less than 5 meV), indicating that the quantum-confinement effect on the band separation is not significant.

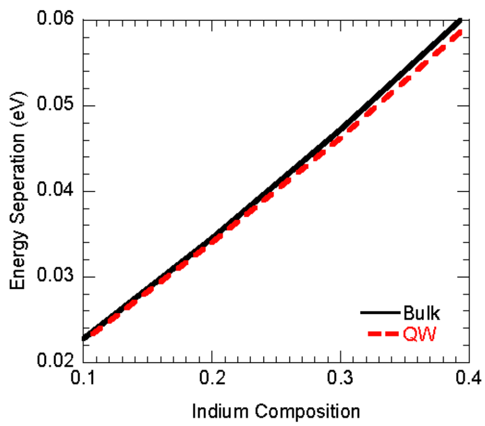

Fig. 6. The calculated energy separation (ΔE) between the top two valance bands at the Γ point $(30\bar{3}1)$ InGaN QW and bulk structures.

4. Conclusion

In summary, we have grown and fabricated LEDs on the semipolar $(30\bar{3}\bar{1})$ and $(30\bar{3}1)$ plane with emission wavelengths ranging from blue to green. These devices have shown high optical polarization ratios and large valance band separations, which may facilitate improved LD performance and reduced power consumption in the back lighting systems. The obtained experiment data are consistent with simulated values obtained by the **k·p** method. The simulation also suggest that strain is the dominate factor for the optical polarization properties of above semipolar QWs, while the quantum-confinement effect is not prominent.

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