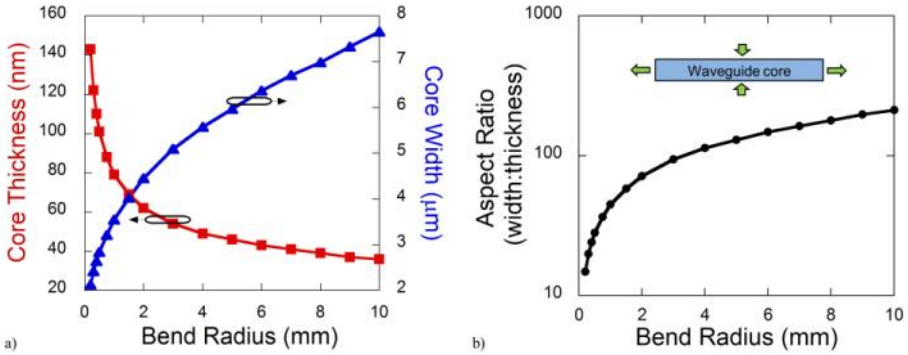

Fig. 8. (a) Simulated (λ = 1550 nm) lowest-loss single-mode core geometry and (b) aspect ratio are plotted versus bend radius.

5. Conclusions

An ultra-low-loss planar waveguide technology is demonstrated to bring the performance advantages of optical fiber-based devices to the chip scale. Although several low-index-contrast (Δn = 0.5 – 2.5%) technologies are also good ultra-low loss candidates, stoichiometric LPCVD Si_3N_4, with an index contrast of ~25%, offers the additional benefits of increased material uniformity and stability. Using a high-aspect-ratio core geometry, ultra-low loss can be obtained in single-mode Si_3N_4 waveguides at bend radii as low as 0.2 mm. In this work, we demonstrate record low losses of 8-9, 5, 3.5, and 3 dB/m at 0.5, 1, 1.5, and 2 mm bend radii, respectively. The challenge of measuring ultra-low loss with sufficient accuracy at chip-scale propagation lengths is met using ring resonator and OFDR techniques.

Acknowledgements

The authors thank Scott Rodgers and Wenzao Li for helpful discussions. This work is supported by DARPA MTO under iPhoD contract No: HR0011-09-C-0123.

#136596 - $15.00USD Received 13 Oct 2010; revised 9 Dec 2010; accepted 13 Dec 2010; published 3 Feb 2011