different designs with a target n_g of 20, 30, 35 and 40. The measurements were carried out using Fourier transform spectral interferometry [12]. It is clear that despite the lower refractive index contrast, sizeable group index values can be achieved, e.g. $n_g \approx 40$ over a 5 nm bandwidth (Fig. 6d), thus highlighting the suitability of the method.

Conclusion

Chalcogenide photonic crystals are a favorable platform for nonlinear optics due to their high nonlinear figure of merit. Due to their lower refractive index and corresponding weaker confinement, it was not obvious whether the same dispersion engineering techniques previously explored in silicon can be used, and whether similar low losses can be achieved. To investigate these issues, we have fabricated dispersion engineered chalcogenide photonic crystal waveguides and demonstrated losses as low as 21dB/cm. In addition, we have shown that the dispersion engineering toolkit can be applied to the chalcogenide system and have demonstrated slow light waveguides with a group index of $n_g \approx 40$. Given the lower phase index n_φ of the waveguide mode, this corresponds to a slowdown factor ($S = n_g/n_\varphi$) of $S \approx 20$, which is considerable and highlights the potential of the system for nonlinear applications. To our knowledge, this is the first demonstration of systematic dispersion engineering in relatively low refractive index photonic crystal waveguides, in particular in chalcogenides. Furthermore, we have shown the benefits of using vapour phase HF etching for the fabrication of photonic crystal membranes.

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