The usage of PCWs of equal lengths leads to a compact design, although the management of cross-talk between channels becomes more difficult as a consequence of the absence of the minimization of back reflections from each section.

3. Conclusion

In conclusion, we propose a wavelength de-multiplexer design based on concatenated photonic crystal waveguides, for which dielectric filling factors are varied in order to target the slow light region. The frequency selectivity of the device originates from the light behavior in the vicinity of the slow light regime due to the high leakage as a result of the wider spatial distribution of the electromagnetic waves inside the main waveguide. The spatial selection of different wavelengths occurs within consecutive PCW sections and we numerically and experimentally demonstrate the successful de-multiplexing of three wavelengths in a compact manner.

The preliminary results of the DEMUX design employing the slow light phenomena are encouraging. However, the DEMUX design can be further studied in order to obtain higher output power levels at each output channel and a linear spacing in de-multiplexed frequencies. Moreover, using the proposed de-multiplexer design idea, slab dielectric PC structures with air holes in triangular lattice form can be a good candidate to create similar devices that work at optical frequencies avoiding the power leakage in the *z*-direction. In addition, the length of each PCW can be optimized to create a more compact design. Such investigations will be the subject of a future study.

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