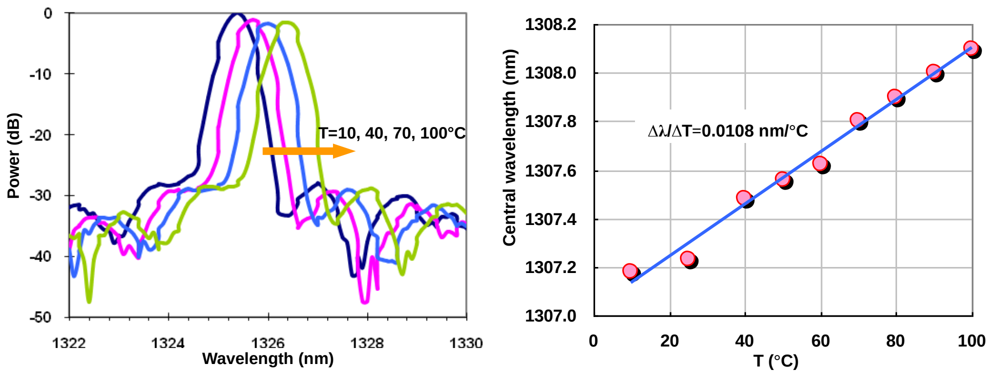
mode is confined in the SiO_2 cladding and consequently the thermal performance is expected to be very similar to a pure SiO_2 buried waveguide.

Figure 5(b) shows the central wavelength as the temperature varies. And the slope is about $\Delta\lambda/\Delta T$ = 0.011 nm/°C, which is very close to that of an AWG based on pure SiO_2 buried waveguides as expected.



(a) (b)

Fig. 5. (a). The spectral response of channel #9 as the temperature varies; (b) the central wavelength of channel #9 as the temperature increases from 10 to 100°C.

3. Conclusions

In this paper, we have demonstrated a low-loss, low-crosstalk AWG (de)multiplexer by using Si_3N_4 buried optical waveguides. The presented AWG (de)multiplexer has 16 channels and the channel spacing is 200GHz (i.e., 1.6nm). The singlemode Si_3N_4 optical waveguide used here has a 5.5µm × 50nm Si_3N_4 core and a 15µm-thick SiO_2 cladding. With such a structure, the Si_3N_4 optical waveguide has a very low scattering loss due to small mode overlap with the sidewall roughness. For the design of an AWG (de)multiplexer, we have chosen a small gap (about 1µm-wide) between adjacent arrayed waveguides to reduce the transition loss between the FPR and the arrayed waveguides. The fabricated AWG (de)multiplexer has been characterized in two wavelength ranges around 1310nm, and 1550nm, respectively. At the shorter wavelength range, the optical confinement becomes stronger and consequently the crosstalk is lower than that at longer wavelengths. It has shown that the crosstalk of adjacent and non-adjacent channels are about –30dB, and –40dB, respectively, at the wavelength range of 1310nm. The design could be optimized further to improve the AWG performance at longer wavelength by choosing a thicker core (e.g., 100~200nm). Finally we have also characterized the temperature dependence of the fabricated Si_3N_4 AWG (de)multiplexer and the temperature dependence is about 0.011nm/°C, which is close to that of a pure SiO_2 AWG device because most power of the fundamental mode is confined in the SiO_2 cladding.

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