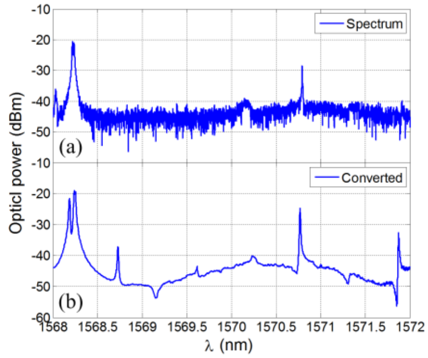

Fig. 6. Comparing of drop-port transmission spectra between (a) wavelength scanning method, and (b) voltage scanning method. The voltage scale is converted to wavelength by using Eq. (5).

Figures 6(a) and 6(b) show the measured transmission spectrum using wavelength-scanning and voltage-scanning methods, respectively. According to Eq. (5), we have $\Delta\lambda$ (pm) $\approx 80V\Delta V$. If the resolution of voltage supply is 1 mV, we obtain the wavelength resolution $\Delta\lambda$ (pm) $\approx 0.08V$. This suggests that for voltage smaller than 1 V, the measurement accuracy for the optical transmission spectrum can be smaller than 0.1 pm. If we use nano-ampere current power supply, the measurement accuracy can go down to 0.2 fm. This is significant for high-Q resonance measurement, which usually requires high-resolution wavelength-scanning lasers. Furthermore, it is noticed that by using voltage-scanning method, the transmission spectrum is much clear with lower noise. Another application for such voltage-scanning method is to trace the wavelength shift of certain system. For instance, Fig. 6(b) can be considered as the voltage response of input wavelength 1572 nm. If the input wavelength shifts, we can easily determine the wavelength shift by scanning the voltage again and compare the voltage responses before and after the wavelength change.

Some of asymmetric Fano resonances are appear in Fig. 6(a), such as the resonance at ~1571.8 nm. We attribute the Fano resonance to the interaction between the microdisk mode and the modes generated inside the high slab crescent coupling region [21]. Its Q value is as high as $\sim 1.6 \times 10^5$. For the optical intensity changing from the maximum to the minimum via TO effect, the voltage change is only ~140 nm or 0.3 mW power change, with ER of ~24 dB. The potential application of such Fano resonance includes on chip spectra analyzer, optical switch and tunable filter.

3. Conclusion

We have investigated the add/drop ridge microdisk resonators. We study the quality factor dependence on the microdisk slab thickness and the waveguide-to-microdisk coupling gap. For microdisk slab, the thicker it is, the more the optical modes and the higher the optical resonance quality factor. For coupling gap, the wider it is, the higher the quality factor. When it is used as thermo-optical tunable filter, we obtained a tuning efficiency of 66.5 pm/mW and extinction ratio of ~27 dB. We also propose and demonstrate the voltage-scanning method for the optical spectra measurement and compared with wavelength-scanning method, which show high resolution and low noise.

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