Experiment on Si waveguide quarter-wave shift and sampled polarization rotation Bragg gratings

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1. Introduction

We reported on theoretical analysis for phase shift, sampled grating and SSG structures using the polarization rotator Bragg grating [1] which can be used as polarization independent wavelength demultiplexers. In this report we present experimental results obtained by these structures.

2. Device structure

The device structures are shown in Fig.1. The rib waveguide type polarization rotator Bragg grating was used. The 150 nm deep grating teeth were cut into the upper rib from sidewall. The rib and the terrace widths were 700 nm and 1000 nm, respectively. The grating period Λ was 369.5 nm. The total waveguide core and terrace thicknesses were 200 nm and 130 nm, respectively.

The half-grating-period phase shift is used for the quarter-wave shift structure. The total length was 600 μm. One unit of the sampled grating is composed of grating and phase shift sections with 30 and 90 grating periods, respectively. The total sampled grating device is composed of 22 units.

A tapered-width-waveguide directional coupler type Y-branch [2] was connected to the input of the grating to separate input and diffracted lights. The transmission light from the grating is connected to an output port directly.

3. Experiment

The device was fabricated using SOI wafer, the immersion ArF lithography and dry etching. Measured wavelength responses are shown in Fig. 2. The branching loss of the Y-branch is separated. For the quarter-wave shift grating, the transmission peak was observed in the reflection band for both the TE and TM modes at the same wavelength as expected. Multiple polarization-independent reflection peaks and transmission notches were observed for the sampled grating device.

4. Conclusions

The experimental results on polarization rotator Bragg grating with quarter-wave shift and sampled grating structures have been reported. Wavelength responses with polarization independence were attained.

Acknowledgements

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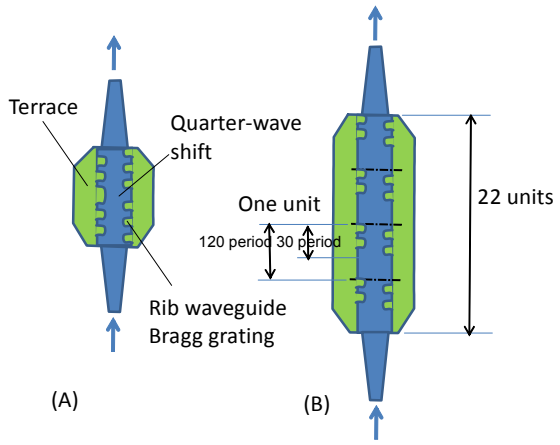

Fig. 1 Device structure (A) quarter-wave shift (B) sampled grating.

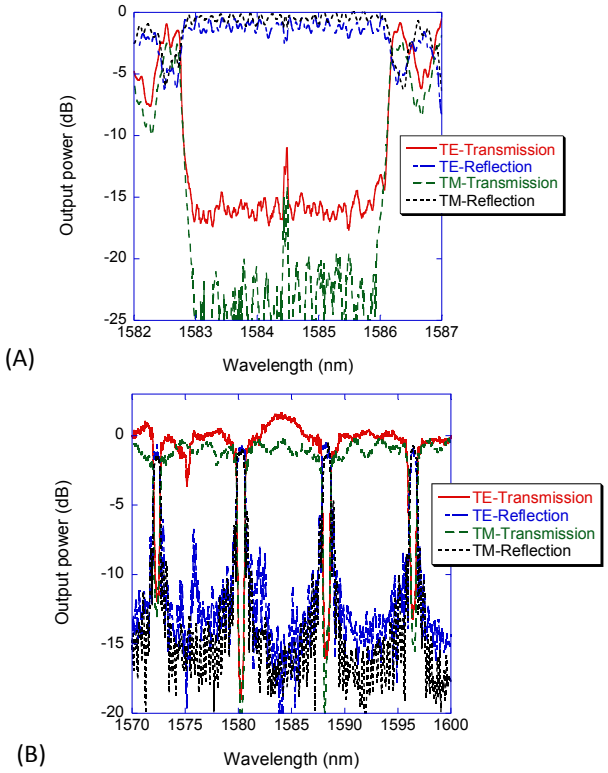

Fig. 2 Measured wavelength response for (A) quarter-wave shift and (B) sampled grating device showing polarization-independent wavelength peaks.

References

[1] H. Okayama et al., Tech. Digest 20th Microoptic Conference (MOC), paper H75, Fukuoka, Japan, 2015. [2] H. Okayama et al., JSAP 2015 Autumn Convention, paper 14p-PA4-2.