

Half Mirror on the Silicon Slab Waveguide

Wildan Panji Tresna^{1,2}, and Takeo Maruyama¹

¹ Graduated School of Natural Science and Technology, Kanazawa University
Kakuma-machi, Kanazawa, Ishikawa 920-1192 JAPAN

² Indonesian Institute of Sciences
Kawasan Puspiptek Serpong, Banten 15314 INDONESIA
*maruyama@ec.t.kanazawa-u.ac.jp

We simulate and measure the some design on the slab waveguide such as taper and curve mirror[1]. In this research we examine about half-mirror design. FDTD simulation is employed for the design of half-mirror operating $1.55\mu\text{m}$ in wavelength and running for TE and TM mode polarizations. The half-mirror divide the power of incident light when through the material, the transmission and reflection power is determined by the thickness of the material.

The optical properties of half-mirror in slab waveguide are constructed from difference refractive index between two material that coincide to each other. This paper propose the half-mirror built from SiO_2 meanwhile, Slab waveguide built from silicon as a core and SiO_2 as its substrate. The half-mirror has been designed as shown in Fig. 1 and will fabricate by foundry service company. In this paper the thickness of the core and substrate were 210 nm and $2\mu\text{m}$ respectively, futhermore the thickness of the half-mirror which construct by SiO_2 also 210 nm[1].

We simulate the thickness dependent of half-mirror to get the 50-50 power reflection and transmission. The thickness variations in simulation that we proposed is from 45nm until 150nm with a certain intervals. The simulation result shows to achieved 50-50 conditions, the thickness of 110nm is needed on TE mode and 140nm on TM mode. These simulation result may could strengthen the experimental data, that the hardware of the Si slab waveuide have a good performance and can be applicated in the next project.

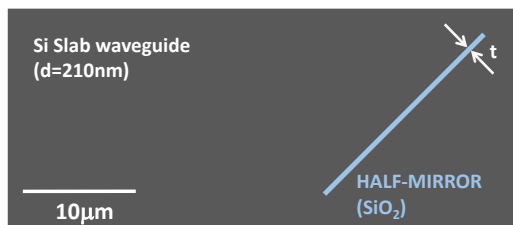


Fig. 1. Half-mirror on the Si slab waveguide.

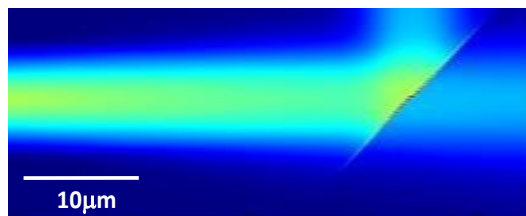


Fig. 2. Simulation result of the half-mirror.

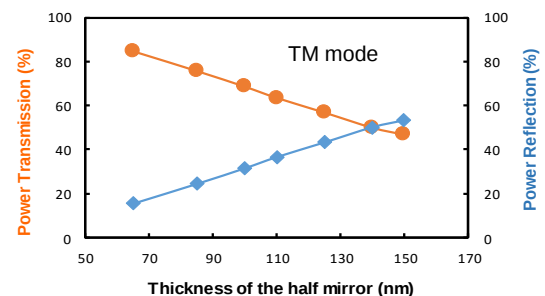
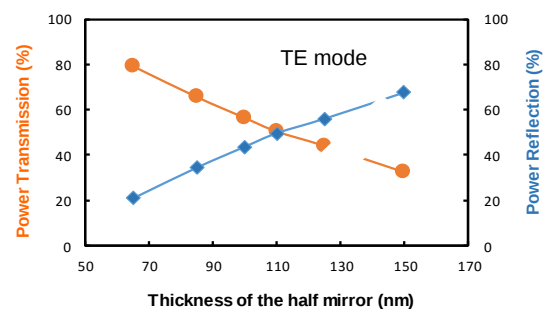


Fig. 3. Thickness dependency on TE and TM mode propagation in half-mirror.

References

- 1) W. P. Tresna, and T. Maruyama, *Spring IEICE 2019*, C-3-3, 19-22 March 2019.
- 2) Y. B. Ovchinnikov, *Optics Comp.* **220** (2003) 229-235.