

Chapter 6

Conclusions

Micro-PBS plays an important role in the micro free space optical pickup. The PBS is expected to be of high transmittance of TM mode and high reflectance of TE mode. Traditional methods of fabricating PBS suffer from being bulky or low efficiency. In order to solve these problems, a low stress SiN based micro-PBS has been demonstrated to possess both good optical and mechanical characteristics, including high transmittance of TM mode, low absorption and low residual stress.

Two types of PBS used for red and blue ray application were fabricated. The properties of the PBS for red light were analyzed, including the chemical, optical, and mechanical characteristics. The etching rate of SiN in HF solution was as low as 4 nm/ min, which could be applied in a surface micromachined PBS. The absorption coefficient, k , was as low as 0.0065, and, therefore, the transmittance of TM mode could be as high as 94% and 88 % for planar and pop-up PBS, respectively. The residual stress was as low as 44 Mpa, which could avoid film breaking issue during releasing.

The other SiN film for PBS developed for blue ray application also possesses similar characteristics. The etching rate of the SiN in HF solution was also as low as 4 nm/ min. The absorption coefficient, k , is about 0.034, which results in the transmittances of TM mode 55 % and 50 % for planar and pop-up PBS of thickness of 488 nm, respectively. The transmittance of TM mode can be further enhanced by decreasing the thickness while maintaining the mechanical strength of the thin film.

The residual stress was about 179MPa. Although the residual stress is also higher as compared with the SiN applied for red light, it is low enough to avoid film breaking issue.

Though some issues remain to be solved, including the deviation from the certain angle, the surface roughness and the curvature of the SiN thin film, for merits mentioned above, the micro-PBS has the potential to apply for a micro optical pickup.

