TT-P036

Optimization of Backside Etching with High Uniformity for Large Area Transmission-Type Modulator

Soo Kyung Lee[1], Byung Hoon Na[2], Gun Wu Ju[2], Hee Ju Choi[3], Yong Tak Lee[1,2,3]*

[1]Department of Nanobio Electronics and Materials, Gwangju Institute of Science Technology, [2]School of Information and Mechatronics, Gwangju Institute of Science and Technology, [3]Department of Photonics and Applied Physics, Gwangju Institute of Science and Technology

Large aperture optical modulator called optical shutter is a key component to realize time-of-flight (TOF) based three dimensional (3D) imaging systems [1-2]. The transmission type electro-absorption modulator (EAM) is a prime candidate for 3D imaging systems due to its advantages such as small size, high modulation performance [3], and ease of forming two dimensional (2D) array over large area [4]. In order to use the EAM for 3D imaging systems, it is crucial to remove GaAs substrate over large area so as to obtain high uniformity modulation performance at 850 nm. In this study, we propose and experimentally demonstrate techniques for backside etching of GaAs substrate over a large area having high uniformity. Various methods such as lapping and polishing, dry etching for anisotropic etching, and wet etching ([20%] C6H8O7 : H2O2 = 5 : 1) for high selectivity backside etching [5] are employed. A high transmittance of 80% over the large aperture area (5×5 mm^2) can be obtained with good uniformity through optimized backside etching method. These results reveal that the proposed methods for backside etching can etch the substrate over a large area with high uniformity, and the EAM fabricated by using backside etching method is an excellent candidate as optical shutter for 3D imaging systems.

This work was supported by Samsung Advanced Institute of Technology (SAIT) and by the (Photonics2020) research project through a grant provided by the Gwangju Institute of Science and Technology in 2012.

References

[1] B. H. Na et. al., Opt. Express, vol. 20, no. 6, pp. 6003-6009, 2012.
[2] Y. H. Park et. al., Proc. SPIE, vol. 8252, pp. 82520X-1-82520X-15, 2012.

[3] C. Amano et. al., IEEE Photon. Technol. Lett, vol. 4, no. 1, pp. 31–33, 1992.
[4] Q. Wang et. al., Opt. Express, vol. 13, no. 9, pp. 3323–3330, 2005.
[5] G. G. Desalvo et. al., J. Electrochem. Soc, vol. 139, no. 3, pp. 831-835, 1992.

Keywords: Time-of-flight (TOF), transmission type electro-absorption modulator (EAM), backside etching of GaAs substrate, high uniformity

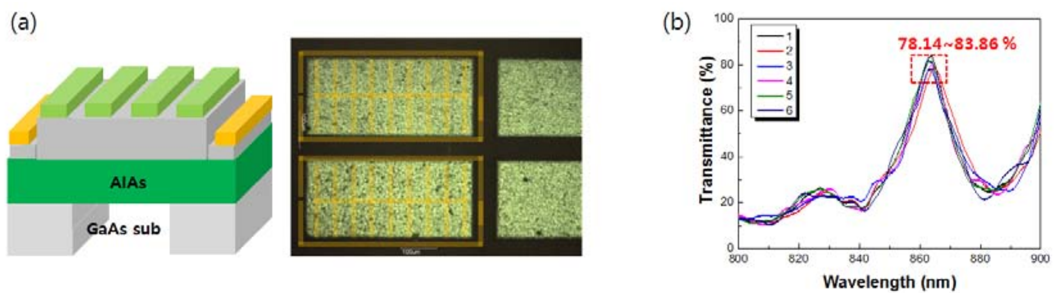

Fig 1. High uniformity backside etching over large area (a) schematic of backside etching (b) measured transmittance spectrum for large area transmission type EAM