

Gas sensing using silica high-mesa waveguide

W-Y. Li, H. Hokazono, S. Enami, H-S, Jiang and K. Hamamoto

The desire of small size health-check system is raised due to the population aging. Compact breath sensor for daily health care may be welcomed because breath test is non-invasive, real time and there are various disease-markers contained in human breath. High-mesa waveguide can be used for gas sensing due to its unique structure that its core can contact to the outside gas, and waveguide can realize compact breath sensing system [1-2]. We have realized CO₂ sensing by using a 4.5cm high-mesa waveguide successfully [3].

Figure 1 shows the CO₂ sensing results from 40% to 80%. As shown in the figure, the light intensity decrease faster while the CO₂ concentration increasing. This figure proves that CO₂ sensing by using silica high-mesa waveguide really happened.

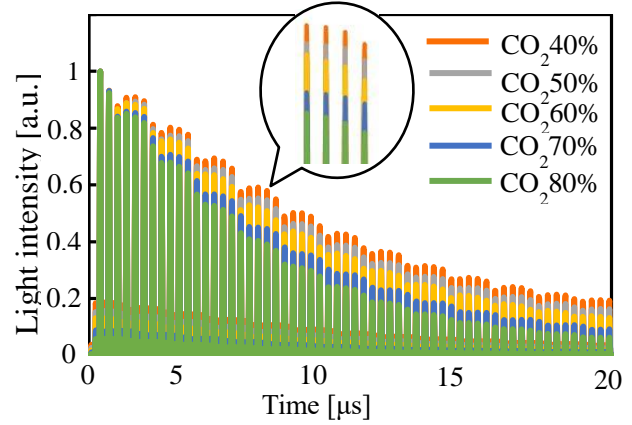


Fig. 1 CO₂ (40-80%) gas sensing results.

CO₂ concentration is estimated by using the difference of the ring-down time [3] between “with CO₂” condition and “Without CO₂” condition. Figure 2 shows the CO₂ sensing result at 40%. By using the ring-down time of 5.95μs and 5.74μs, the concentration is estimated as 39%. The other estimated results and ring-down times are shown in Tab.1. The accuracy of all the cases were within 2%.

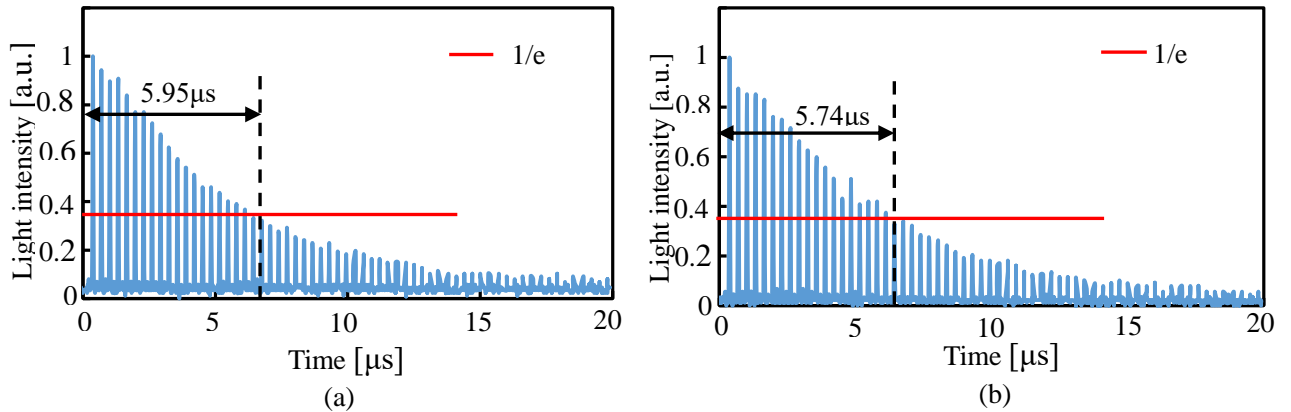


Fig.2 40% CO₂ ring-down waveform. (a) Without CO₂. (b) With CO₂.

Tab. 1 Estimated concentration of CO₂ and ring-down times

Absolute concentration of CO ₂ [%]	Estimated result of CO ₂ [%]	Ring-down time [μs]	
		Without CO ₂	With CO ₂
70	70	11.38	9.47
60	58	10.05	8.93
50	51	16.46	14.28
40	39	5.95	5.75

Reference

- [1] A. Wilk et al., Vol. 402, Issue 1, pp. 397-404, 2012
- [2] S. Yano et al., Con. Proc. IPNRA, IWA7, 2007.
- [3] H. Hokazono et al., IEICE Electronics Express, Vol. 12, No. 15, pp. 1-8, 201.