

Gas Sensing Using Silica High-Mesa Waveguide

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CRDS system utilizing waveguide for breath sensing realizes several meter optical path integration that has possibility for ppm-order gas sensing within a compact area^[1-2]. We have proposed optical amplifier assisted gas sensing system scheme^[3] to compensate waveguide propagation loss that may prevent ppm-order gas detection. Figure 1 shows the experiment set-up configuration of gas sensing system utilizing waveguide. The amplifier in CRDS system, however, may result in self-lasing at specific wavelength in case of high pumping condition. Figure 2 (a) is the spectrum when self-lasing happens. Once self-lasing happens, signal light lose its gain from amplifier. Figure 2 (b) is the cavity ring-down waveform with only 3 pulses.

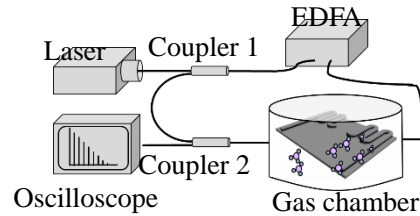


Fig. 1. Experiment set-up configuration of gas sensing system utilizing waveguide.

We proposed the scheme of polarization direction control to suspend the self-lasing. Figure 3 (a) is the spectrum after polarization direction control. It illustrates that the self-lasing power is suppressed down below -50 dBm. We estimated that a gain of 24 dB is improved at signal. Figure 3 (b) is the cavity ring-down waveform after polarization direction control. In this waveform, more than 200 pulses is achieved, which corresponds to the ability for 10 ppm-order CH₄ detection^[4].

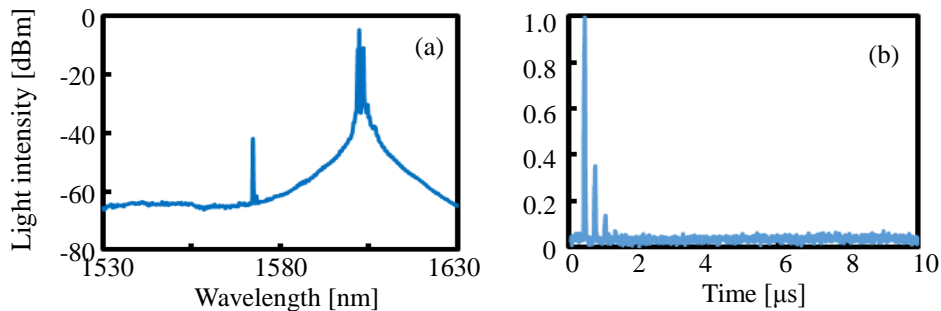


Fig. 2. Amplifier assisted CRDS system with self-lasing occurs (a) spectrum and (b) cavity ring-down waveform.

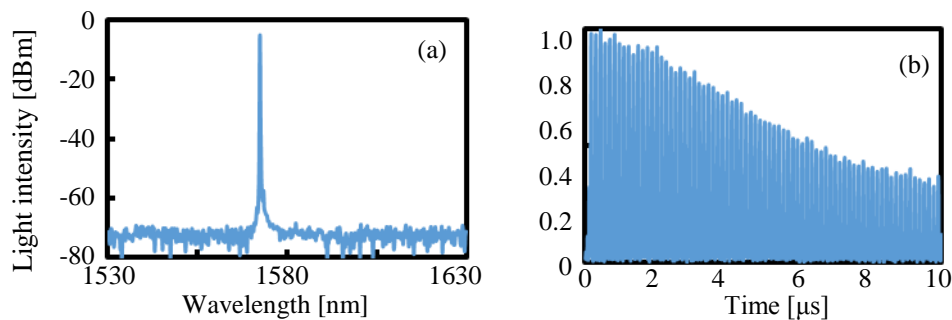


Fig. 3. Amplifier assisted CRDS system with polarization direction control, (a) Spectrum and (b) cavity ring-down waveform.

Reference

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