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Sensor development of CO₂ gas temperature and concentration using 2mm DFB semiconductor laser

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ABSTRACT

A laser diode absorption method to measure CO₂ gas temperature and concentration was developed using a 2.0 m DFB(Distributed Feedback) laser. The optics was fabricated in a pigtail fashion and the entire optical interferometer filter, and a fiber ring interferometer was all developed for the-system. The measurement sensitivity at different sweep frequencies and pre-set CO₂ concentrations was evaluated using a test cell. The results showed that the system has a 2% error over a wide range of operating frequencies and concentration measurements were made close to the flame front of a premixed laminar flame. The instantaneous gas flame temperature measured using a 2-line absorption scheme was compared to that determined with a thermocouple.

The application of the developed CO₂ sensor for exhaust gas measurement in a practical engine was done. The results indicate the time variation of the absorption lines for 2 wavelength coincided each other that demonstrated the CO₂ variation period could be measured.



Fig. 1 Pigtail DFB laser module

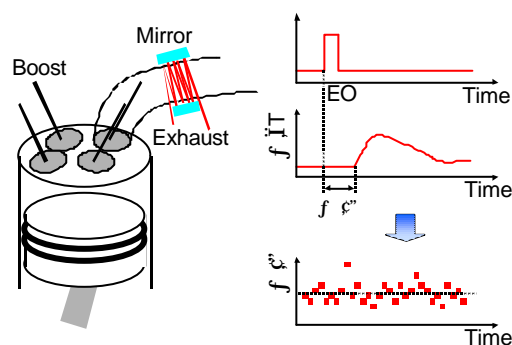


Fig. 2 The Application to 2 stroke engine measurement