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利用課題名(日本語) :  
Program Title (English) : Performance evaluation of photonic integrated circuits-based OFDR sensing system  
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## 1. 概要(Summary)

In this research, we are evaluating the performance of OFDR (Optical Frequency Domain Reflectometry) interferometer integrated on a photonic chip, which can be connected to conventional tunable laser and detectors in order to demonstrate the feasibility of OFDR-based sensing using photonic integrated circuits (PIC).

## 2. 実験(Experiment)

### **【利用した主な装置】**

ステルスダイサー(DISCO DFL7340)、マニユアルウエッジボンダー(WestBond 7476D)

### **【実験方法】**

One of the key components of the OFDR-based sensing system is an interferometer formed by a 3 dB coupler, a broadband reflector, and Bragg grating as a sensing element. In this research, the interferometer is fabricated on a photonic chip using electron-beam lithography and diced with stealth dicer DISCO DFL7340.

The sensing element consists of two waveguide Bragg gratings (WBG) with Bragg wavelength at 1525 nm and 1550 nm. To validate the applicability of developed integrated interferometer for distributed measurement, a micro-heaters of different lengths were fabricated on top of WBG. By injecting electrical current into the micro-heaters, the temperature of WBG can be controlled at specific locations. To inject the current into micro-heaters, the 9x9 mm chip was wire bonded to a gold-

plated printed circuit board using a West Bond 7476D manual wire bonder (Fig. 1).

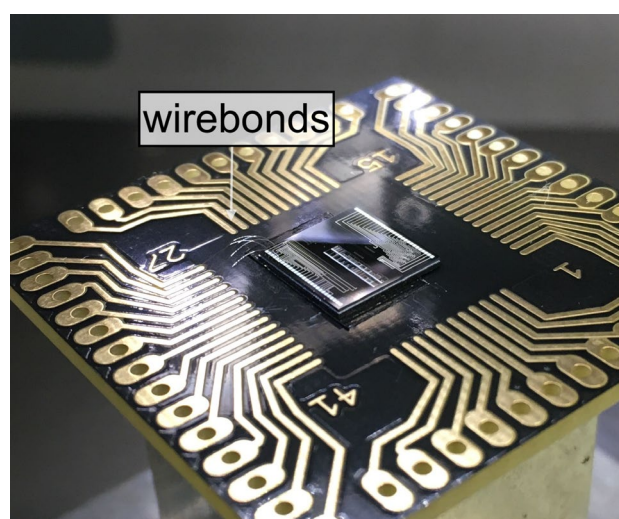


Fig. 1. Wire bonded chip (9x9 mm) with PIC-based interferometer.

## 3. 結果と考察(Results and Discussion)

An optical spectrum of fabricated WBG is presented in Fig. 2. A shift of Bragg grating central wavelength can be interpreted as a change of temperature. The reflected spectrum can be obtained at different positions along the Bragg grating by applying STFT (Short-Time Fourier Transform) to the reflected optical signal.

In the next stage, the electrical current will be injected into micro-heaters to change the Bragg wavelength of the grating at different locations. As the location and the geometry of micro-heaters is known, it will allow to evaluate the spatial resolution of the developed sensing system.

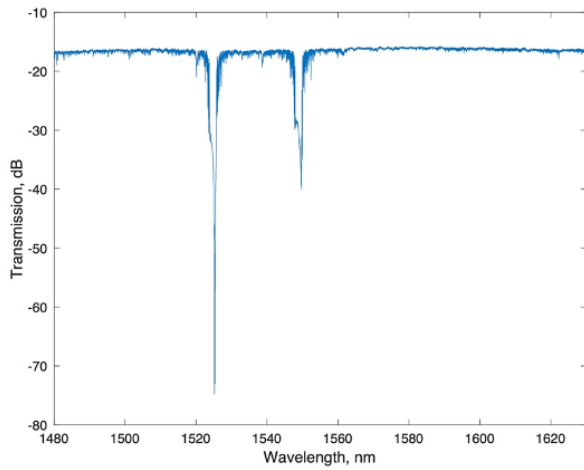


Fig. 2. Transmission spectrum of waveguide Bragg gratings.

#### 4. その他・特記事項 (Others)

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#### 5. 論文・学会発表 (Publication/Presentation)

なし

#### 6. 関連特許 (Patent)

なし

