課題番号　　:F-20-WS-0283
利用形態　　:機器利用
利用課題名（日本語）　　:さまざまな構成での高感度でコンパクトなブラッググレーティング
Program Title (English)　　:Highly sensitive and compact Braggs gratings in various configurations
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キーワード／Keyword　　:リソグラフィ・露光・描画装置, SOI, Brag grating, sensor

1. 概要（Summary）

The two major areas for silicon on insulator (SOI) technology are telecommunications and biosensing. For the former it is needed to have high speed modulation and for the later highly effective sensors. In the current research various waveguide configurations for Bragg gratings (BG) were studied to make them more susceptible for sensing.

2. 実験（Experimental）

【利用した主な装置】

電子ビーム描画装置、電子ビーム蒸着装置

【実験方法】

Most prominent issue which one would observe when making complex shapes to the sensors is that the metal should come off as one piece as is seen when fabricating rectangular fully etched grating couplers (RFEGC) using lift off method or inverse exposure as shown in following figure:

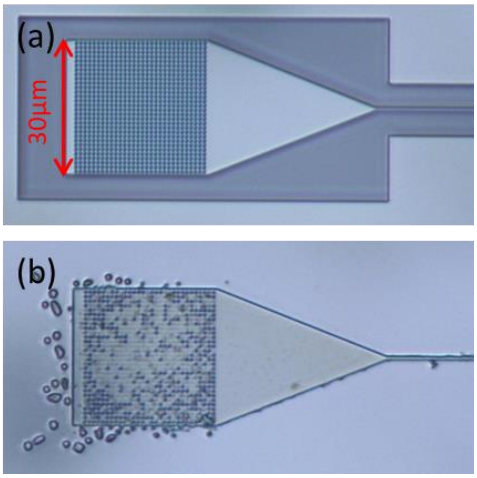

Fig. 1 Microscope images of RFEGCs fabricated with (a) lift-off method and with inverse exposure.

3. 結果と考察（Results and Discussion）

Without increasing sensor footprint size to use for example Vernier effect [1] the highest sensitivity values are obtained by manipulating waveguide shape [2]. Initially in this research multi slot sub wavelength BGs were used obtaining sensitivity of 730 nm/RIU. To increase this value the waveguide was made suspended increasing the value to 1100 nm/RIU with the whole device and zoom in of the sensor shown in the following figure.

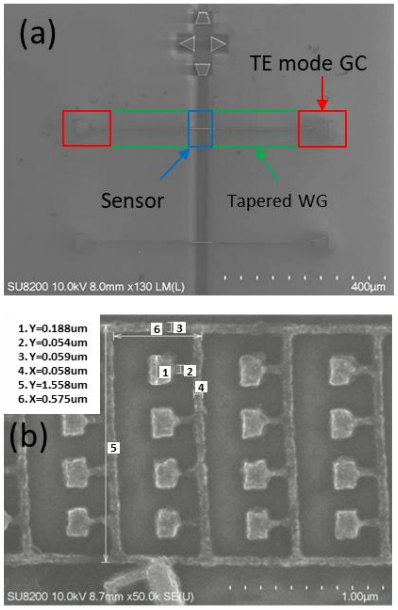

Fig. 2. Suspended complex BG sensor (a) zoom out view and (b) zoom in view.

4. その他・特記事項（Others）

・参考文献

[1] E. Luan et al., Biomed. Opt. Express, 10(9), 4825, 2019. doi: 10.1364/BOE.10.004825

[2] Yiwei Xie et. al., Sensors, 20(9), 2640, doi: 10.3390/s20092640

5. 論文・学会発表（Publication/Presentation）

1） H. Siim、Y. Matsushima、H. Ishikawa and K. Utaka, 第82回応用物理学会秋季学術講演会、2021年9月10日.

6. 関連特許（Patent）

なし。