

課題番号 : F-16-UT-0056
利用形態 : 機器利用
利用課題名(日本語) :
Program Title (English) : Development of mid-infrared air-cladding suspended membrane devices
利用者名(日本語) : 合田圭介¹⁾²⁾³⁾, 程振洲¹⁾, 肖廷辉¹⁾
Username (English) : K. Goda¹⁾²⁾³⁾, Z. Cheng¹⁾, T. -H. Xiao¹⁾
所属名(日本語) : 1) 東京大学大学院理学系研究科, 2) カリフォルニア大学ロサンゼルス校工学部, 3) 科学技術振興機構
Affiliation (English) : 1) School of Science, The University of Tokyo,
2) School of Engineering & Applied Science, University of California, Los Angeles
3) Japan Science and Technology Agency

1. 概要(Summary)

Mid-infrared (mid-IR) integrated photonics has attracted a great deal of attention due to its promising applications in sensing, spectroscopy, and thermal imaging. Group-IV materials provide an excellent platform to develop mid-IR integrated photonic chips because of their wide transparency window, low cost, and CMOS-compatible fabrication process. However, these photonic chips usually suffer from a strong optical absorption originating from substrates, namely buried oxide (BOX) in silicon-on-insulator (SOI) wafers. To overcome this limitation, in this project, we developed an air-cladding suspended membrane configuration for on-chip mid-IR applications.

2. 実験(Experiment)

【利用した主な装置】

高速大面積電子線描画装置 F5112+VD01, 高速シリコン深掘りエッチング装置, 電子顕微鏡

【実験方法】

We designed and fabricated a grating coupler to couple mid-IR light into air-cladding suspended membrane waveguides. We utilized electron beam lithography (F5112) to write the devices' patterns on a resist (ZEP-520A) and used a deep reactive ion etching machine (MUC21-ASE) to transfer the patterns from the resist to wafers. The BOX below the photonic devices was locally removed with

hydrofluoric acid, then the photonic devices become suspended and supported by two-side cantilevers. After fabrication, we checked the structure of the fabricated devices by using a scanning electron microscope (S-4700).

3. 結果と考察(Results and Discussion)

The scanning electron microscope image of the fabricated grating coupler is shown in Fig. 1. Subwavelength structures in the grating coupler were successfully fabricated on silicon. Now we are working on coupling light from an optical fiber to air-cladding suspended membrane waveguides via the grating coupler.

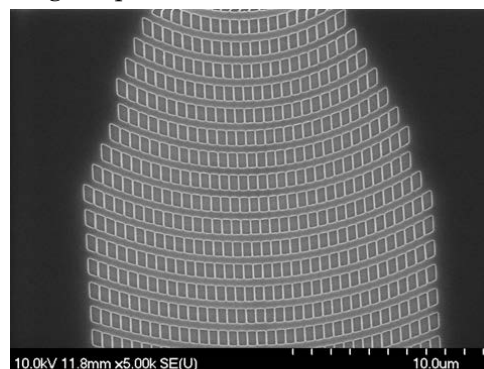


Figure1 Scanning electron microscope image of a focusing subwavelength grating coupler.

4. その他・特記事項(Others)

なし

5. 論文・学会発表(Publication/Presentation)

なし

6. 関連特許(Patent)

なし