

*課題番号 : F-12-UT-0111
 *支援課題名 (日本語) : 中性ビームエッチングを用いたリング共振器
 (東北大学流体科学研究所一般公募共同研究)
 *Program Title (in English) : Damage Free Ring Resonator Using Neutral Ion Beam Etching
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*概要 (Summary) :

電子ビーム露光装置を用いる事により,リング共振器のマスクまで東大にて作製し,東北大学のオリジナル技術であるダメージフリーに特長のある中性ビームエッチング技術によるリングを作製している。

*実験 (Experimental) :

EB Resist mask with the patterns of microring resonators was defined by using the electron beam lithography. The Neutral Beam Etching (NBE) condition was investigated for the silicon waveguide fabrication. Cl_2 is used for the main etchant in this experiment. The photoluminescence (PL) spectra of the fabricated silicon ring resonators were measured by a micro PL system.

*結果と考察 (Results and Discussion) :

In order to obtain vertical sidewall, a higher ICP power of 1000W and additional bottom potential of 10W were applied. The optimized NBE condition creates a close to 90-degree sidewall of silicon waveguide, which is ideal for optical propagation. The etching rate of silicon using the optimized condition is 14 nm/min. Using the optimized condition, the silicon microring resonators were formed by NBE and characterized by the PL system. Theoretically, narrow resonant peaks due to Purcell effect should be observed for a silicon microring resonator. Fig. 1 shows the typical PL spectrum of NBE formed silicon ring resonators. Clear and sharp resonant peaks with quality factor of $\sim 10^3$ can be obtained, indicating that the ring waveguide etched by the neutral beam technology can be available for the processing of silicon photonic devices. Since this technology is a low damage

process and the process is possible to be well controlled, the neutral beam technology could also be applied for the post-process.

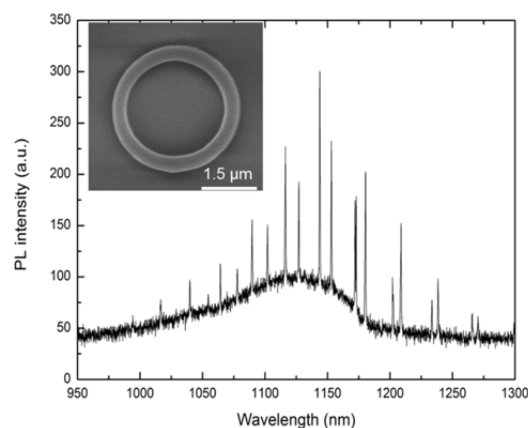


Fig.1 Typical PL spectrum of the silicon ring resonators fabricated by neutral beam etching process. Inset is SEM photo of the silicon microring resonator.

*その他・特記事項 (Others) :

・参考文献

J. Cai, S. Samukawa and K. Wada, “Low Damage Fabrication of Si Photonic Devices by Neutral Beam Technology”, in *Proc. of the Eleventh International Symposium on Advanced Fluid Information and Transdisciplinary Fluid Integration*, Sendai, (2011), pp. 112-113.

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(Publication/Presentation) :

なし

関連特許 (Patent) :

なし