課題番号　:F-19-KT-0161
利用形態　:機器利用
利用課題名（日本語）　:Si と SOI ウエハを用いた Si トーションミラーデバイスの開発
Program Title(English)　:Development of torsional mirror device based on Si and SOI wafer
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1. 概要（Summary）

MEMS torsional micro mirror device is a scanning device that scans a laser beam by reflecting it. Its reliability under the condition of high frequency and large scanning angle can be improved by dimensional downscaling. Comparing with micro mirror fabricated by silicon-on insulator (SOI) wafer, the same device fabricated by Si wafer could cost less. The aim of this work is to develop micro mirror based on Si wafer and compare its performance with SOI based same device.

2. 実験（Experimental）

【利用した主な装置】

Stepper , Photoresist Developer, Plasma CVD, Deep Reactive Ion Etching machine, UV bonding alignment

【実験方法】

Both SOI wafer and Si wafer were engaged in this work for micro mirror device fabrication. The fabrication process for SOI based device is shown in Fig. 1. The dimensions of the SOI-based devices is Si/SiO_2/Si with a thickness of 15/1/400 μm, respectively. First the Stepper (A02) and photoresist developer (A10) will be engaged to fabricate the top side pattern. Then DRIE (B08) will be used to etch the Si at the exposed position with Bosch process. After the top side Si being etched, UV bonding alignment (B16) will be used to fabricate the back side pattern and DRIE will be used again to etch the Si at the back side. Finally the SiO_2 will be etched with BHF, and the device based on SOI was finished.

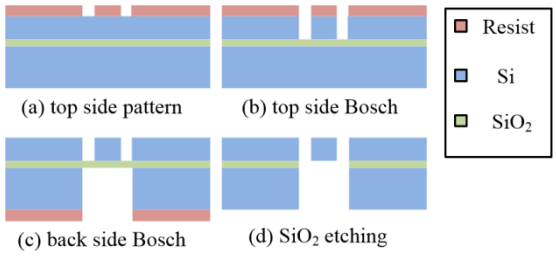


Fig. 1 fabrication of SOI-based mirror.

The fabrication process for SOI based device is shown in Fig. 2. The top side pattern fabrication is same as the SOI-based devices. During the DRIE process, first Bosch process will be engaged to fabricate a straight beam and then isotropic ecthing process will be engaged to relase the beam. After that Plasma CVD will be used to deposit SiO_2 layer for protection. After the back side pattern fabrication and a Bosch process continued with the revmoal of the SiO_2 layer, the Si-based device was fabricated.

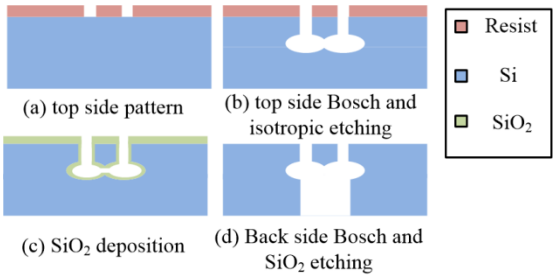
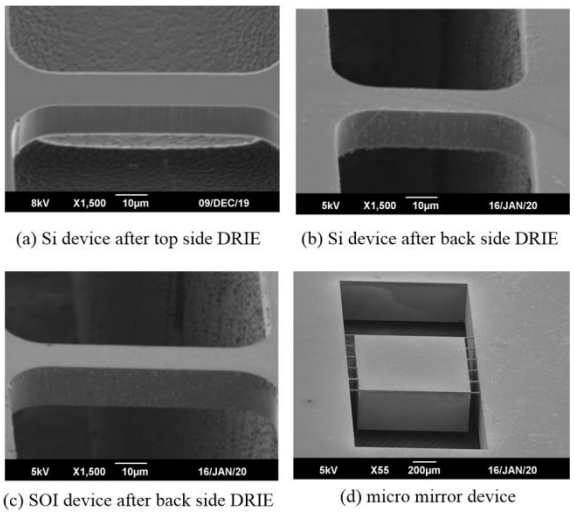


Fig. 2 fabrication of Si-based mirror.

3. 結果と考察（Results and Discussion）

Fig. 3(a) and (b) presents the Si-based device after top and back side DRIE. The beam kept a good shape without damage. Fig. 3(c) presents the SOI device after BHF release. The beam also kept a good shape. Fig. 3(d) presents a SEM photo of the micro mirror.



(a) Si device after top side DRIE　(b) Si device after back side DRIE

(c) SOI device after back side DRIE　(d) micro mirror device

Fig. 3 SEM photo of the devices.

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。