課題番号　　　　　　　　:F-14-AT-0056
利用形態　　　　　　　　:機器利用
利用課題名（日本語）　　:EB 描画装置校正用マーク作製
Program Title (English)　:Metal marks with straight edges for EB lithography
利用者名（日本語）　　　:小幡　利顕
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Affiliation (English)　　:CRESTEC Corp. Electrical tech. group, Tech. Dev.

1. 概要（Summary）

Recent techniques with EB lithography allow us to fabricate micro and nano electro mechanical devices. It is a good demonstration for us to show that our CRESTEC high resolution EB machine is a powerful tool for making such devices. By use of the metal deposition systems in AIST, we demonstrate the metal mark fabrication with the smallest line edge roughness.

2. 実験（Experimental）

・Instruments

真空蒸着装置、ダイシングソー、反応性イオンエッチング装置（RIE）、ナノサーチ顕微鏡(SPM3)

・Experiments

Square patterns are exposed by our EB lithography machine, CABL-9000C whose scanning modules are much more stable than before by updating the internal circuit. Metal mark patterns are formed on the wafer surface by metal film deposition and subsequent lift off process. The wafer is cut into pieces by using Dicing Saw machine. In order to make the structure edges shaper, we sometimes dry-etch the surface by RIE.

3. 結果と考察（Results and Discussion）

SEM micrographs of fabricated metal marks are shown in Fig. 1. Al metal mark (Left) is fabricated by vacuum evaporator with resistive-heating at our company and Au metal mark (Right) is fabricated by EB gun evaporator at AIST. The device on right panel shows sharper edge than the device on left. We find the typical edge roughness +/-10nm at most, which is almost so small as the resist resolution. We consider that the main reason of this improvement is due to the well-controlled evaporation rate. In conclusion, we have the edges of metal marks much sharper than before. We thank for helps in Nano Processing Facility at AIST.

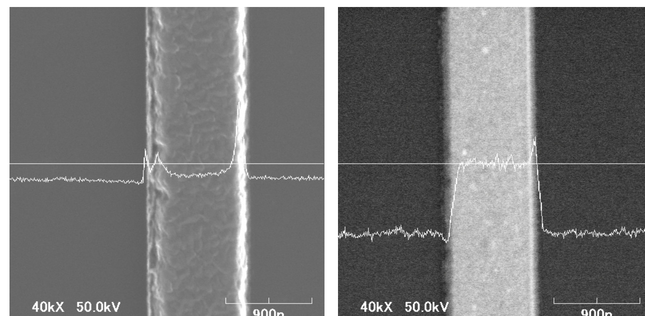

Fig. 1. SEM micrographs of metal marks. The solid lines crossing the centers of photographs show the current magnitude (arb. unit). Left) Al metal mark. Right) Au metal mark. The line edge roughness is improved on the right figure, because of the precise tuning system of metal evaporation rate.

4. その他・特記事項（Others）

本実験は沖野　輝昭、菅田　正徳、大井　英之との共同研究で行われた。機器利用に関して産業技術総合研究所ナノプロセシング施設（NPF）の山崎将嗣様、中島忠行様、廣沢友二様、佐藤平道様、秦信宏様、秋永広幸様に感謝します。

5. 論文・学会発表（Publication/Presentation）

なし。

6. 関連特許（Patent）

なし。