

課題番号 : F-21-UT-0080
利用形態 : 機器利用
利用課題名(日本語) :
Program Title (English) : Spin-orbit torque magnetization switching
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キーワード/Keyword : リソグラフィ・露光・描画装置; スピン軌道トルク

1. 概要(Summary)

To induce a spin-orbit torque magnetization switching in a GaMnAs single layer and the Pd/Co₂FeSi structure with a smaller size, the ADVANTEST F7000S-VD02 was used to fabricate a cross-bar with a width of 500 nm and a length of 2000 nm by electron beam (EB) lithography. In addition, a gate electrode was fabricated for investigating an electric field effect.

2. 実験(Experimental)

【利用した主な装置】

超高速大面積電子線描画装置(ADVANTEST F7000S-VD02)

【実験方法】

The EB lithography for fabricating a 500 nm-wide cross-bar is divided into 3 steps.

1) For depositing the alignment mark and electrodes.

Resist: ZEP-520A (4000 rpm for 60 s; baking at 180 °C for 5 min)

Exposure: Dose amount: 105 $\mu\text{C cm}^{-2}$; Single Path mode.

Development: ZED-N50 for 60 s. MIBK for rinse.

2) For etching the cross-bar structure.

Resist: ZEP-520A-7 (6000 rpm for 60 s; baking at 180 °C for 5 min)

Exposure: Dose amount: 60 $\mu\text{C cm}^{-2}$; single path.
Development: ZED-N50 for 60 s. MIBK for rinse.

3) For depositing the gate electrode.

Resist: ZEP-520A (4000 rpm for 60 s; baking at

180 °C for 5 min)

Exposure: Dose amount: 105 $\mu\text{C cm}^{-2}$; Field Path mode (#2).

Development: ZED-N50 for 60 s. MIBK for rinse.

3. 結果と考察(Results and Discussion)

The fabricated device with a width of 500 nm and a length of 2000 nm is shown in Fig. 1.

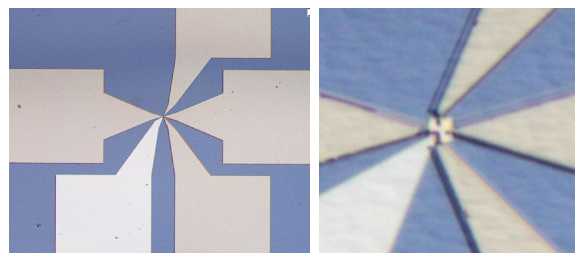


Fig. 1. Microscope picture of a cross-bar with a width of 500 nm and a length of 2000 nm.

4. その他・特記事項(Others)

なし。

5. 論文・学会発表(Publication/Presentation)

1) M. Jiang, H. Asahara, S. Sato, *et al.*, *EP2DS-24/MSS-20*, invited talk, M-10-01, 2021.

2) M. Jiang, H. Asahara, S. Ohya, *et al.*, *APS March Meeting*, Oral presentation J36 0004, 2021.

6. 関連特許(Patent)

なし。