

課題番号 : F-15-NM-0067
利用形態 : 機器利用
利用課題名 (日本語) : Fabrication of structures for iPCM
ProgramTitle(English) : Fabrication of structures for iPCM
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1. 概要 (Summary)

The project is aimed on the study of the potential of the new generation of non-volatile electrical memory – interfacial phase-change memory (iPCM), based on superlattice structures of GeSbTe with advanced switching characteristics. The important part of the project is the fabrication of the nanometer-scaled devices, which requires the use of such high-precision methods as electron-beam lithography.

2. 実験 (Experimental)

【利用した主な装置】

- ・ 125kV 電子ビーム描画装置
- ・ 100kV 電子ビーム描画装置

【実験方法】

The electron-beam lithography was used for patterning the sample structures for their further use in the interfacial phase-change memory devices fabrication. The pattern was consisted of squared areas (corresponding to the filament areas in device cells) from 50 to 500 nm size. The photoresist gl2000-11 with the thickness about 300 nm and pre-annealing at 180°C for 2 minutes was used. The exposure dose was about 400 $\mu\text{C}/\text{cm}^2$. By checking the photoresist after the exposure (and the sample after the further etching) by the microscope the sufficient accuracy of the patterning was confirmed.

3. 結果と考察 (Results and Discussion)

The main achieved result of the project is the reveal of the high potential of the interfacial phase-change memory, based on superlattice

structures of GeSbTe. The devices that were fabricated with the use of the electron beam lithography show a better performance, comparing with the conventional PCM devices: lower SET voltage (see Figure 1) and current as well as better cyclability (more than $2 \cdot 10^7$ cycles). The work will be continued for the further improvement the switching characteristics of the fabricated devices.

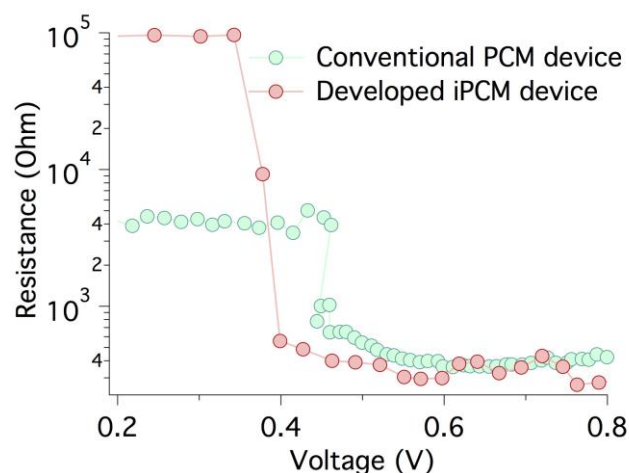


Figure 1. The comparison of the R/V curves for the developed iPCM and conventional PCM devices.

4. その他・特記事項 (Others)

The rest of the fabrication process was implemented in the National Institute of Advanced Industrial Science and Technology (AIST), within a framework and funded by the project entitled “Initiative for Most Power-efficient Ultra-Large Scale data Exploration” (IMPULSE).

5. 論文・学会発表 (Publication/Presentation)

No papers/presentations were published/made.

6. 関連特許 (Patent)

No patent was granted.