

課題番号 : F-20-RO-0056
 利用形態 : 機器利用
 利用課題名(日本語) :
 Program Title (English) : Investigate the characteristic of crystalline silicon film induced by micro thermal plasma jet
 利用者名(日本語) :
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 キーワード/Keyword : solid phase crystallization, silicon film, Hall effect, lithography
 リソグラフィ・露光・描画装置

1. 概要(Summary)

Solid phase crystallization (SPC) of silicon film is potential material for new generation of thin film transistors (TFTs). Micro-thermal-plasma-jet (μ -TPJ) is simple way with low cost to induce millisecond SPC of silicon.

2. 実験(Experimental)

【利用した主な装置】

マスクレス露光装置、エッチング装置(レジスト Ashing 用)、ホール効果測定装置

【実験方法】

Characteristics of crystallized films were investigated by Hall effect and 4-point-probe measurement. Thin film transistors with SPC film as source – drain and channel were prepared. In fabrication process, we performed maskless lithography, chemical dry etching and Asher. All equipments are in RNBS, Hiroshima University.

3. 結果と考察(Results and Discussion)

P-doped-a-Si films was noted as single layer, P-doped-a-Si/a-Si films was noted as double layer. Figure 1 shows the resistivity of crystallized films. It was about $4 \times 10^{-3} \Omega$ in case of scanning speed $v = 400$ mm/s and increase with the increase of v . It can

around $10 \text{ cm}^2/\text{Vs}$ in case of double layer when v is lower than 500 mm/s . These properties are sufficient to get high performance of device.

4. その他・特記事項(Others)

なし。

5. 論文・学会発表(Publication/Presentation)

1. “Characteristics of Rapidly Solid Phase Crystallized Amorphous Silicon Films Formed by Micro-Thermal-Plasma Jet Irradiation”, Hoa ThiKhanh Nguyen, H. Hanafusa, Y. Mizukawa, S. Hayashi, S. Higashi, 2020 International Conference on Solid State Devices and Materials (SSDM2020), (ALL-VIRTUAL conference, Sept. 27-30, 2020). pp. 681-682.

2. “Investigation on Rapid Solid Phase Crystallization of Amorphous Silicon Films Induced by Micro-Thermal-Plasma Jet”, Nguyen ThiKhanh Hoa, Yuri Mizukawa, Hiroaki Hanafusa, Seiichiro Higashi, JSAP Autumn Meeting 10p-Z10-7 (2020.9.8-11、Online).

3. “Investigation on millisecond solid phase crystallization of amorphous silicon films induced by micro thermal plasma jet”, Hoa Thi Khanh Nguyen, Hiroaki Hanafusa, Yuri Mizukawa, Seiichiro Higashi, Silicon Device and Materials, (2020.10.22. Online)

4. “Characteristics of Millisecond Solid Phase Crystallization of Phosphorous Doped Silicon Film Annealed by Thermal-Plasma-Jet Irradiation”, Nguyen ThiKhanh Hoa, Hiroaki Hanafusa, Seiichiro Higashi, JSAP Spring Meeting 18p-Z24-7 (2021.03.16-2021.03.19 Online)

6. 関連特許(Patent)

なし。

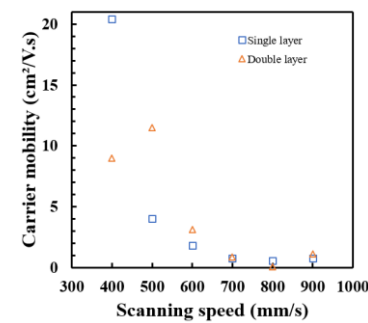
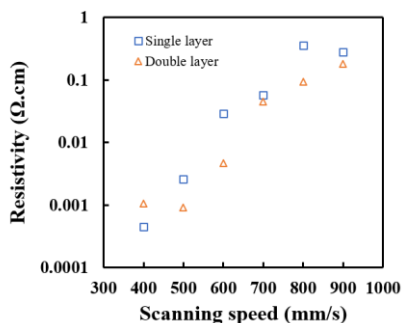


Fig.1. Resistivity of crystallized film.

Fig.2. Carrier mobility of crystallized film.

be seen that the structure of film does not have much effect on the value of resistivity. Figure 2 shows the carrier mobility of crystallized films. It is