

課題番号 : F-21-KT-0020  
利用形態 : 技術代行  
利用課題名(日本語) : テラヘルツ反射ミラーの作製  
Program Title (English) : The fabrication of mirror at terahertz frequencies  
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キーワード/Keyword : リソグラフィ・露光・描画装置、EB蒸着、メタマテリアル

### 1. 概要(Summary)

For the ultrastrong electric field enhancement at terahertz frequencies, split ring resonators (SRRs) with nanometer-scale gap are required. This time, we succeeded to precisely fabricate a large amount of SRRs by using the Large Area and Ultra-High Speed Electron Beam Lithography at Nano Technology Hub, Kyoto University.

### 2. 実験(Experimental)

#### **【利用した主な装置】**

大面積超高速電子線描画装置

(Large Area and Ultra-High Speed Electron Beam Lithography)

#### **【実験方法】**

All processes shown below are performed at Nano Technology Hub, Kyoto University.

- (1) Spin coating resist (ZEP520A) and conducting layer (300Z) on substrate Quartz
- (2) Electron beam (EB) lithography and developing
- (3) EB evaporation (Ti 10nm/Au 190nm) and lift-off
- (4) Evaluation by using optical microscopy and scanning electronic microscope (SEM)

### 3. 結果と考察(Results and Discussion)

The sample (SRRs) are shown in Fig. 1. Fig. 1 is the optical microscopic image where the yellow structures are SRRs. Fig. 1 is the image taken by SEM which evaluates the gap size of one SRR. The gap size in design is 0.1  $\mu\text{m}$ , but the actually fabricated gap size is 0.08  $\mu\text{m}$ . Thus, to compensate

for the error, we adjust the gap size in design from 0.1  $\mu\text{m}$  to 0.12  $\mu\text{m}$ .

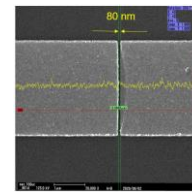


Fig. 1 Image of gap region of one SRR (0.1 mm gap in design) taken by SEM.

### 4. その他・特記事項(Others)

Thanks for the help from Yoshiyuki Inoue.

・参考文献:[1] Z. Y. Zhang, H. Hirori, F. Sekiguchi, A. Shimazaki, T. Nakamura, A. Wakamiya, and Y. Kanemitsu, “Ultrastrong coupling between cavity photons and phonons at terahertz frequencies realized in submicron-gap split ring resonators”, 学会名:International Symposium on Creation of Advanced Photonic and Electronic Devices 2021, 番号:A13, 2021年3月,ポスター

### 5. 論文・学会発表(Publication/Presentation)

なし

### 6. 関連特許(Patent)

なし。