

課題番号 : F-21-KT-00107  
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 (2)  
Program Title (English) : The fabrication of mirror at terahertz frequencies (2)  
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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 necessary. In 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 samples of metallic structure are shown in Fig.1. Fig.1 is the optical microscopic image where the yellow structures are split ring resonators (SRRs). The experiment on the cavity strong coupling with phonon in pervskite semiconductors shows the large vacuum Rabi splitting. The

splitting energy is varied by changing the gap length of the structure.

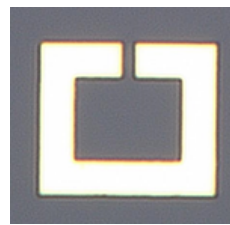


Fig. 1 Optical microscopic image of fabricated metallic structure.

### 4. その他・特記事項(Others)

Thanks for the help from 井上良幸様. He fabricated these samples for us.

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

[1]”Ultrastrong coupling between THz phonons and photons caused by an enhanced vacuum electric field”, Z. Zhang, H. Hirori, F. Sekiguchi, A. Shimazaki, Y. Iwasaki, T. Nakamura, A. Wakamiya, and Y. Kanemitsu, Phys. Rev. Research 3, L032021 (6 pages) (2021).

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### 6. 関連特許(Patent) なし。