

課題番号 : F-19-RO-0019
利用形態 : 技術補助
利用課題名(日本語) : 連結したスクエアリング形状によるメタマテリアル完全吸収体の研究
Program Title (English) : Multi-Peak Metamaterial Perfect Absorber with Connected Square Rings
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キーワード/Keyword : リソグラフィ・露光・描画装置、膜加工・エッチング、Absorber、multiband、meta-surface

1. 概要(Summary)

Studies on absorber metamaterials today are of great interest due to the prospect of its application in new technology such as sensors, energy harvesting, radar stealth etc. This paper presents an absorber structure that operates at 100 GHz region created by two resonant rings and its response when two rings are electrically connected to each other. The connection clearly generates new absorption peaks and creates a simple multi-peak absorber structure that is easy to implement in practice with an ON/OFF device connected to the meta-surface circuit. The investigation on the effect of the connection position also reported and discussed in this study. The measurement is in process.

2. 実験(Experimental)

【利用した主な装置】

マスクレス露光装置

【実験方法】

Our samples are prepared as follows: On the two sides of polyimide wafers, copper are deposited. Square rings are structures used as unit cells of metamaterials.

For fabrication process: Photolithography is applied to make the structures. The resist is deposited on the upper copper layer by spin coater. After being exposed with designed masks, exposed resist is removed by developer. Copper is etched by FeCl_3 solution. Finally, the remained resist is removed by acetone solution.

The absorption of this metamaterials can be measured by Vector Network Analyser. However, we have not got the measurement data due to the limitation of our facilities and equipment in the laboratory. We are waiting the collaboration with the Institute of Material and science, Vietnam for this study (7/2020).

3. 結果と考察(Results and Discussion)

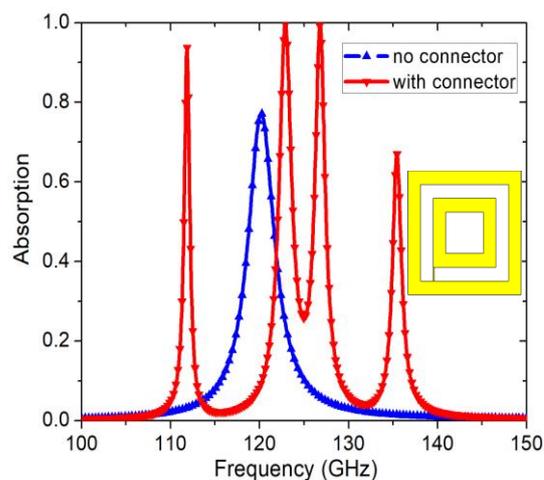


Fig. 1. Simulated absorption spectra of square ring structure metamaterials

As being seen in Fig. 1, the disconnected square ring structure metamaterials has a single peak. By using the electric connector, one can achieve multiband absorber at from 110 GHz to 140 GHz with new configurations

The single square ring structures and connected square ring structures are fabricated. Their surfaces are observed by microphotograph shown in Fig. 2.

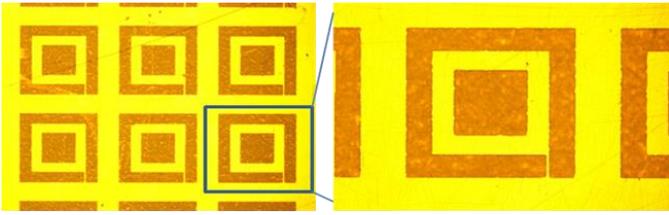


Fig. 2. Micorphotographs of fabricated samples

4. その他・特記事項 (Others)

In fact the simulation of this research is presented in this conference (10/2019) but without proceeding.

<https://vpshv1.org.vn/vi/news/hoi-nghi-hoi-thao/hoi-nghi-toan-quoc-lan-vi-vat-ly-ky-thuat-ung-dung-93.html>

5. 論文・学会発表 (Publication/Presentation)

Oral Presentation: Thuy Nguyen Thi et al., “Multiband metamaterial absorber creating by connecting inductance rings in the structure”, the 6th domestic conference on Engineering and Applied Physics, October 22-26, 2019, Thai Nguyen, Vietnam.

6. 関連特許 (Patent)

「なし。」