

課題番号 : F-17-TU-0015
利用形態 : 機器利用
利用課題名(日本語) : Micron pattern devices for THz image system
Program Title (English) : Micron pattern devices for THz image system
利用者名(日本語) : 韓正利¹⁾
Username (English) : Zhengli Han¹⁾
所属名(日本語) : 1) 理化学研究所 テラヘルツ光源研究チーム
Affiliation (English) : 1) Riken, Tera-Photonics Research Team
キーワード/Keyword : 成膜・膜堆積, Film metamaterial, Photolithography, THz wave

1. 概要(Summary)

THz wave holds the unique fingerprint characteristics on many molecules, leading to the active researches on the THz spectroscopy and THz image. We propose to use the micron pattern devices (or so called metamaterial) for various THz applications such as remote sensing, nondestructive inspection and so on. We have designed micron pattern devices working on THz frequency range. We use the facility of μ SIC (micro system integration center) at Tohoku University to fabricate the micron devices.

2. 実験(Experimental)

【利用した主な装置】

両面アライナ露光装置一式(両面アライナ、スピコンコータ、オープン、現像機、乾燥機)、ステツパ、EB 描画装置、レーザ描画装置、芝浦スパッタ装置、電子ビーム蒸着装置、ダイサ、Tencor 段差計、デジタル顕微鏡、熱電子 SEM

【実験方法】

We mainly use the photolithography technique to fabricate the micron devices. A polymer substrate is employed to accommodate the micron devices. Wet etching process is applied for the metallic micron patterns. Since the minimum size is around $5\ \mu\text{m}$, it needs to take careful attention for the entire device process. We began with a handle wafer and finally the polymer substrate was released to obtain the film metamaterial device. The process optimization is under developing.

3. 結果と考察(Results and Discussion)

By several try and error tests, we have succeeded to obtain the film metamaterial device with releasing from the handle wafer, as shown in Fig. 1. The micron array has a process yield close to 100%.

4. その他・特記事項(Others)

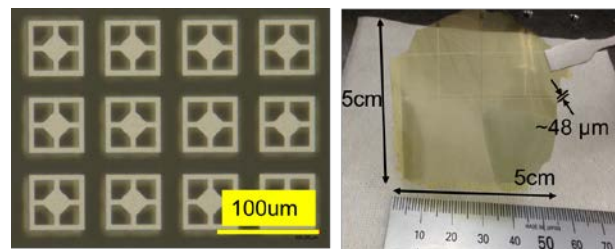


Fig. 1 Developed film metamaterial device.

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5. 論文・学会発表(Publication/Presentation)

(1) Zhengli Han, Seigo Ohno, Yu Tokizane, Kouji Nawata, Takashi Notake, Yuma Takida and Hiroaki Minamide, “Thin terahertz-wave phase shifter by flexible film metamaterial with high transmission,” Optics Express Vol. 25, Issue 25, pp. 31186-31196 (2017).

(2) Zhengli Han, Yu Tokizane, Kouji Nawata, Mio Koyama, Andreas Karsaklian Dal Bosco, Yoichi Ogata, Takashi Notake, Yuma Takida, Hiroaki Minamide, “Flexible Film Metamaterial for an Ultrathin THz-wave Phase Coding Plate,” in Proc. 8th International Conference on Surface Plasmon Photonics (**SPP8**), Taipei, Taiwan (May 22-26, 2017)

(3) Zhengli Han, Yu Tokizane, Kouji Nawata, Takashi Notake, Yuma Takida, Hiroaki Minamide, “Flexible Film Metamaterial for a thin THz-Wave Phase Shifter,” 第78回応用物理学会秋季学術講演会, 7p-A409-11, 福岡国際会議場 (2017年9月7日)

(4) Zhengli Han, Seigo Ohno, Yu Tokizane, Kouji Nawata, Takashi Notake, Yuma Takida and Hiroaki Minamide, “Film metamaterials applied to THz optics”, the 5th RIKEN RAP Symposium, Sendai (Nov. 29-30, 2017)

6. 関連特許(Patent)

なし