

課題番号 : F-21-NU-0022
 利用形態 : 機器利用
 利用課題名(日本語) :
 Program Title (English) : Unidirectional thermal conductivity enhancement in yttrium iron garnet due to the effect of spin waves
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1. 概要(Summary)

The main objective of this research is detecting and measuring the asymmetric thermal conductivity enhancement due to the interaction between, electrons, spin waves and phonons. For that, a measurement technique is developed based on lock-in thermography technique to prove and quantitatively measuring this enhancement. Accordingly, a metallic line heater configuration needs to be deposited on the surface of the measured material by photolithography and sputtering techniques.

2. 実験(Experimental)

【利用した主な装置】

レーザー描画装置(Heidelberg Instruments 社製 DWL66FS), 両面露光用マスクアライナ(Suss Micro Tec AG製 MA-6), スパッタリング装置一式(キャノンアネルバ製 E-200S)

【実験方法】

The laser mask writer Heidelberg DWL66FS is used to write a Cr mask of the heater configuration. The mask aligner MA-6 is then used for the photolithography process. After that, the sputtering device E-200S is used to deposit a Cr layer 5 nm as an adhesive layer and 50 nm of Au to construct the configuration of the line heater.

3. 結果と考察(Results and Discussion)

Fig. 1 shows the schematic diagram of the LIT-based developed technique. The thermal camera captures a sequence of thermal images and then the analysis system lock-in the amplitude and

phase at each pixel based on the Fourier transform algorithm. Fig. 2 shows an example of the locked-in amplitude a phase for a line heater deposited on Si. By analyzing the temperature field. The asymmetric thermal conductivity can be estimated.

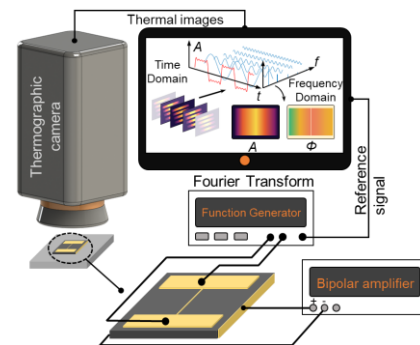


Fig. 1 Schematic diagram of the developed LIT based measurement technique.

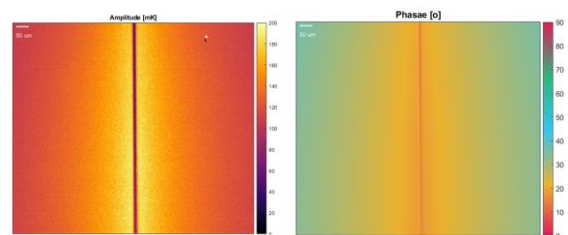


Fig. 2 Thermal images in term of the locked-in amplitude and phase of the thermal wave generated by the line heater at $f = 1$ Hz.

4. その他・特記事項(Others)

none

5. 論文・学会発表(Publication/Presentation)

none

6. 関連特許(Patent)

none