

課題番号 : F-16-UT-0031
 利用形態 : 機器利用
 利用課題名(日本語) :
 Program Title (English) : Development of Liquid-Crystal-Enhanced Electret Generator
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1. 概要(Summary)

Electret/Electrostatic vibration generators attract much attention because of high power output per unit volume at low frequency compared to its counterparts, electromagnetic and piezoelectric. In this project, liquid-crystal-enhanced electrostatic vibration generator has been proven to generate much higher power output compared to that of conventional one [1] with the aid of the anisotropic permittivity of liquid crystal (LC). We propose the use of liquid crystal (5CB) as anisotropic permittivity liquid for enhancing the performance of electrostatic vibration generator.

2. 実験(Experimental)

【利用した主な装置】

高速大面積電子線描画装置, マスク・ウエーハ自動現像装置群, ブレードダイサー

【実験方法】

The device is consisted of 2 interdigitated electrodes as shown in Fig. 1. The interdigitated electrodes are fabricated by standard MEMS fabrication techniques. Finally, the interdigitated electrodes are separated by the blade dicer DAD3650. After the 2 interdigitated electrodes are prepared, they are put into the testing bench for measurement of the output voltage.

3. 結果と考察(Results and Discussion)

Fig. 2 shows the power output versus resistance at 500-V bias voltage. The vibration frequency is 10 Hz, and the amplitude is 1 mm_{p-p}. 5CB with anisotropic permittivity is used as LC. The model results are in good agreement with our previous experimental data [1].

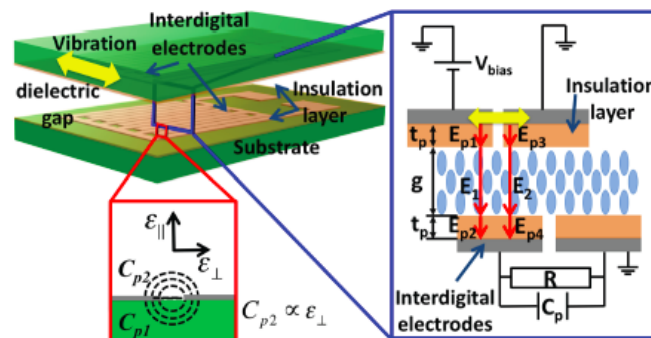


Fig. 1 The schematic of liquid-crystal-enhanced electrostatic vibration generator.

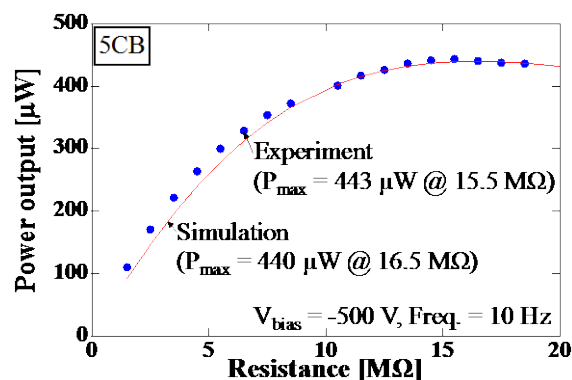


Fig. 2 Power output as a function of resistance of experiments (marker) and simulations (red line).

4. その他・特記事項(Others)

<参考文献>

[1] K. Kittipaisalsilpa, T. Kato, and Y. Suzuki, 29th IEEE Int. Conf. Micro Electro Mechanical Systems (MEMS'2016), pp.37-40 (2016).

5. 論文・学会発表(Publication/Presentation)

(1) Kittipaisalsilpa, K., and Suzuki, Y., Int. Symp. Micro-Nano Sci. Tech. 2016, Tokyo, SuP1-A-4 (2016).

6. 関連特許(Patent)

なし