課題番号　　:F-17-UT-0071
利用形態　　:機器利用
利用課題名(日本語)　　:
Program Title (English)　:Fluorinated Nematic Liquid Crystal for High-power Electret Energy Harvester
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キーワード／Keyword　　:リソグラフィ・露光・描画装置, Liquid Crystal, Electret, Energy Harvester

1. 概要(Summary)

In this project, we use a pair of interdigital electrode to perform in-plane vibration power generation experiment. The results show that the output power of the electrostatic energy harvester is increased with the increase of gap permittivity. Additionally, using liquid crystal as dielectric fluid results in 100 times higher output power than that of air gap.

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】

2.1 Interdigital Electrode Fabrication

The interdigital electrodes are prepared by sputtering Cr/Au/Cr on 4-inch TEMPAX Glass wafer and by standard photolithography. The sample is cut by DAD340.

2.2 Power Generation Experiment

The electrodes are fixed on the upper stage and 1D-movable bottom stage. The upper one is supplied with -400 V while the bottom one is connected with the testing circuit.

3. 結果と考察(Results and Discussion)

Figure 1 shows the output power versus the load resistance for different dielectric fluids in the electrode gap. The output power of the electrode gap filled with nematic liquid crystal is 490 μW, which corresponds to 98 times higher than that for the air gap (P_{max} = 4.98 μW). The optimum load decreases due to the increase in permittivity of the electrode gap.

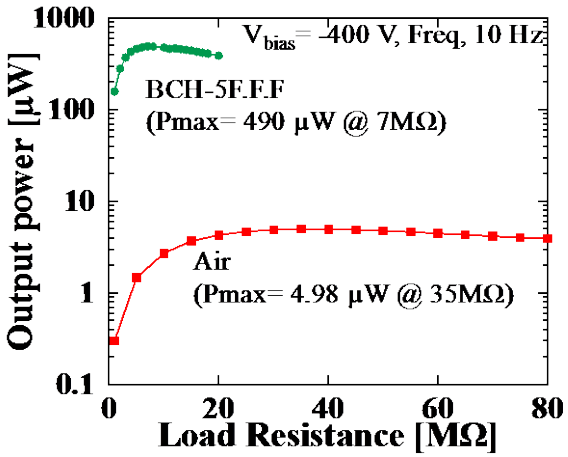

Figure 1: Output power versus load resistance for different dielectric fluids in the electrode gap.

4. その他・特記事項(Others)

なし

5. 論文・学会発表(Publication/Presentation)

(1) K. Kittipaisalsilpa, T. Kato and Y. Suzuki, *The 17th International Conference on Micro and Nanotechnology for Power Generation and Energy Conversion Applications (PowerMEMS'17)*, Kanazawa, Japan, Nov 14-16, 2017.

6. 関連特許(Patent)

なし