課題番号　　:F-19-UT-0016
利用形態　　:機器利用
利用課題名（日本語）　　:
Program Title (English)　:Liquid-crystal-enhanced Electret Vibration Energy Harvester
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キーワード／Keyword　　:切削，エネルギー関連技術，Liquid Crystal, Energy Harvester

1. 概要（Summary）

In this project, we use a pair of interdigital electrodes to perform in-plane vibration power generation experiment with electret as voltage source. The results show the enhancement in output power when nematic liquid crystal is used in the gap.

2. 実験（Experimental）

【利用した主な装置】

ブレードダイサー(DAD3650)。

【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. Then, standard photolithography process is performed. The sample is cut by DAD3650. Next, the photoresist is removed. One of the samples is coated with CYTOP-EGG and charged to -1000V.

2.2 Power Generation Experiment

Electret electrode is mounted to the top stage while Charge-collector electrode is fixed onto 1D-vibration stage. It is connected to external load resistance. The output voltage is collected through data logger.

3. 結果と考察（Results and Discussion）

Finished electrodes are shown in Figure 1. Figure 2 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 139 μW which corresponds to 7 times higher than that of air gap (P_{max} = 19.6 μW). As shown in the figure, the optimum load is decreasing corresponding to the increase in permittivity in the electrode gap.

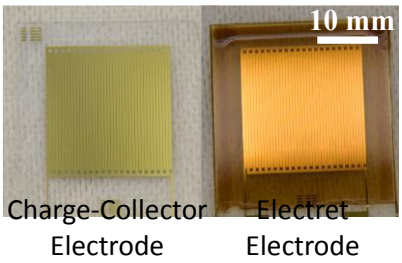

Figure 1: Substrates with CYTOP electret and charge-collector electrodes

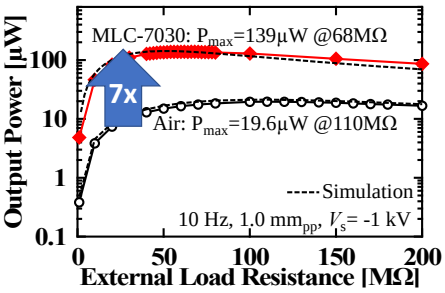

Figure 2: Output power versus load resistance for different dielectric fluids in the electrode gap.

4. その他・特記事項（Others）

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- This work is supported by JST CREST Grant number JPMJCR15Q3 and JPMJCR19Q1.

5. 論文・学会発表（Publication/Presentation）

(1) K. Kittipaisalsilpa, T. Kato, Y. Suzuki, *19th Int. Conf. on Micro and Nanotechnology for Power Generation and Energy Conversion Applications (PowerMEMS'19),* Krakow, Poland, 2019.

6. 関連特許（Patent）

なし。