

課題番号 : F-21-UT-0107
利用形態 : 機器利用
利用課題名(日本語) :
Program Title (English) : Development of rotational electret energy harvester with synchronous circuits
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キーワード/Keyword : リソグラフィ・露光・描画装置, エネルギー関連技術, Energy Harvester

1. 概要(Summary)

A nonlinear interface circuit, known as synchronized switch harvesting on inductor (SSHI), for in-plane rotational electret kinetic energy harvesters (EHs) was developed. Experimentally, 505 μW was harvested with SSHI at a rectified voltage of 142 V for an in-plane rotational electret EH rotating at 1 rps. The output power is 2.47 times larger than that with a full-bridge rectifier, in good agreement with the simulation results.

2. 実験(Experimental)

【利用した主な装置】

超高速大面積電子線描画装置

【実験方法】

A photo mask of a novel dual-stage design is fabricated and developed.

3. 結果と考察(Results and Discussion)

An in-plane rotational electret kinetic energy harvester (EH) was developed. The rotor and stator which were microfabricated based on MEMS technologies are shown in Fig. 1. In the rotor part (Fig. 1a), a 360-nm-thick Cr/Au/Cr layer was first sputtered on a Tempax (glass) wafer. A total of 109 poles were then patterned by standard photolithography (Figs. 1b and 1c).

It is shown through power generation experiments that the output power of the present device with SSHI

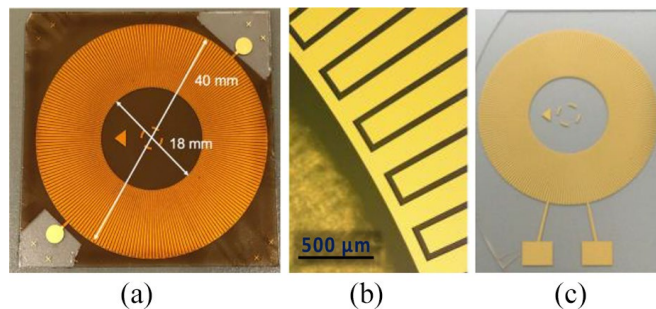


Fig. 1 Fabricated rotational electret EH: (a) rotor, (b) magnified view of the rotor, and (c) stator.

reaches as much as 505 μW at a rectified voltage of 142 V and the rotational speed of 1 rps. It is also shown that a power gain of 1.82 has been obtained in the self-powered SSHI.

4. その他・特記事項(Others)

- 共同研究者 : Prof. Adrien Badel, SYMME Laboratory, Université Savoie Mont Blanc, France
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5. 論文・学会発表(Publication/Presentation)

Liu, Y., Badel, A., and Suzuki, Y., "Output Power Enhancement of Rotational Electret Energy Harvester Using Synchronized Switch Harvesting on Inductor," J. Intell. Mater. Syst. Struct., 13pp., (2021).

6. 関連特許(Patent)

なし