

課題番号 : F-20-TU-0032
 利用形態 : 機器利用
 利用課題名(日本語) : MEMS/NEMS の作製
 Program Title (English) : MEMS/NEMS fabrication
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 キーワード/Keyword : 成膜・膜堆積, 形状・形態観察, Thermoelectric material, thermoelectric generator, energy harvester

1. 概要(Summary)

This work focuses the high performance micro-thermoelectric generators (TEGs) based metal doped electrochemical deposition. Ultra-thick (~2 mm-thick) and compact electrodeposited thermoelectric materials have been successfully synthesized with high Seebeck coefficients S (~143 μ V/K), high electrical conductivity δ (970S/cm) and low thermal conductivity K (0.6W/mK). Figure of merit ZT at room temperature reaches approximately 1 which is one of key factor for high performance TEG.

2. 実験(Experimental)

【利用した主な装置】

- . 住友精密 TEOS PECVD 装置
- . エッチングチャンバー
- . DeepRIE 装置#1
- . メタル拡散炉
- . 熱電子 SEM
- . 両面アライナ露光装置一式

【実験方法】

The thermoelectric material is synthesized by the three-electrode system. The electrolyte solution consisted of 30 mM Bi³⁺ and 35 mM HTeO₂⁺ was mixed with desired weight of Ni ions.

3. 結果と考察(Results and Discussion)

Ultra-thick and compact electrodeposited films have been achieved, as shown in Fig. 1. Thick electrodeposited film was diced into small pieces. The thermoelectric elements were mounted on the prepared substrate by cream solder (Fig. 2). 2cm x 2cm x 2.5mm thermoelectric generators have been fabricated successfully.

4. その他・特記事項(Others)

なし

5. 論文・学会発表(Publication/Presentation)

1. N.V. Toan, T.T.K. Tuoi, K.F. Samat, H. Sui, N. Inomata, M. Toda, and T. Ono, “High performance micro-thermoelectric generator based on metal doped electrochemical deposition”, *IEEE MEMS 2020*, 570-573, 2020.

6. 関連特許(Patent)

なし

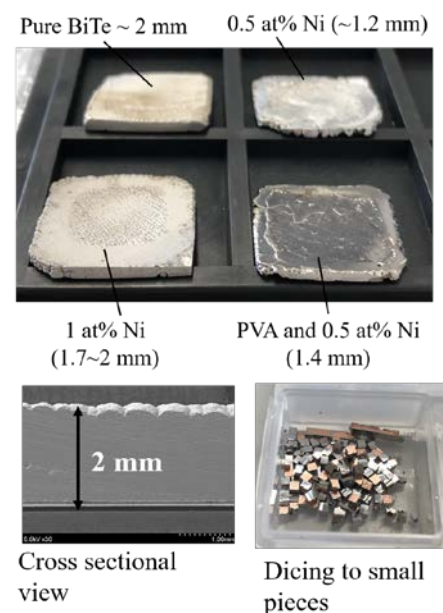


Fig. 1 Experimental result.

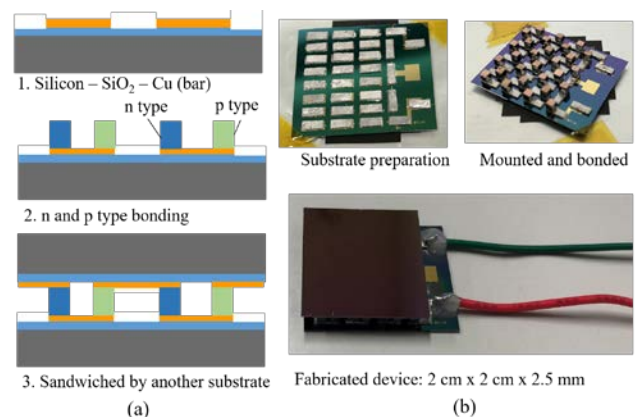


Fig. 2 Fabricated TEG.