Supplementary materials

Fabrication of Skutterudite-based Tubular Thermoelectric Generator

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Type	Ref.	Electrode	Joining method	Specific contact resistance per thermocouple ($\mu\Omega\cdot cm^2$)	Power density (W/cm^2)
Planar	[1]	Cu/Pd-Ni	Soldering ($Pb_{93.5}Sn_5Ag_{1.5}$)	2.948	0.9
	[2]	Cu/Fe-Ni	Brazing (Incusil-series)	2.15	2.1
	[3]	Ti-Al	-	5	-
	[4]	Cu	Soldering ($Zn_{78}Al_{22}$)	477	0.08
Tubular		This work	MRW ($Ag_{61.5}Cu_{24}In_{14.5}$)	6.09	0.52

Table S1. Comparison of electrode, joining method, specific contact resistance, and power density of the recently reported SKD-based thermoelectric generator.

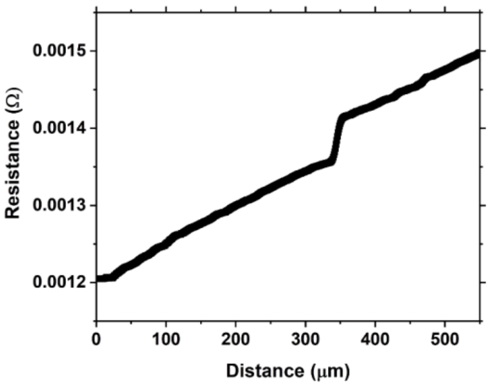

Figure S1. Electrical resistance at the joining interface between the SKD and the Cu electrode

Calculation of the resistance of the tubular thermoelectric generator

The electrical resistance at the given temperature is simply given by formula (1), where ρ is an electrical resistivity, L is a length, and A is an area of a material.

$$\mathrm{R} = \rho\frac{L}{A} \quad (1)$$

In this case, however, the temperature varies inside the TEG. To reflect a change of the electrical resistivity with temperature, a resistance of cylindrical segment with inner radius of r and outer radius of r+Δr, and length of ΔL is considered. Here, the resistance of the i^{th} element (ΔR_i) is given by formula (2).

$$\Delta R_i = \rho(T_i)\frac{\Delta L}{\pi(\Delta r)^2} \quad (2)$$

Assuming that the temperature change inside the TE material is linear, the temperature of the i^{th} element (T_i) is calculated by arithmetic mean of the temperature at radius r_i and at radius $r_i+\Delta r$ as formula (3).

$$T_i = \frac{T(r_i) + T(r_i + \Delta r)}{2} \quad (3)$$

For the simplicity, let $\mathrm{n} = \frac{r_{tot}}{\Delta r} = \frac{L_{tot}}{\Delta L}$. Then, equating (2) and (3) and summing up of each element gives the total electrical resistance (R_{tot}) as formula (4).

$$R_{tot} = \sum_{i=1}^{n} \rho\left(\frac{T(r_i) + T(r_i + \Delta r)}{2}\right)\frac{\Delta L}{\pi(\Delta r)^2} \quad (4)$$

References

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