Electronic supplementary information

Power generation from the $Cu_{26}Nb_2Ge_6S_{32}$-based single thermoelectric element with Au diffusion barrier

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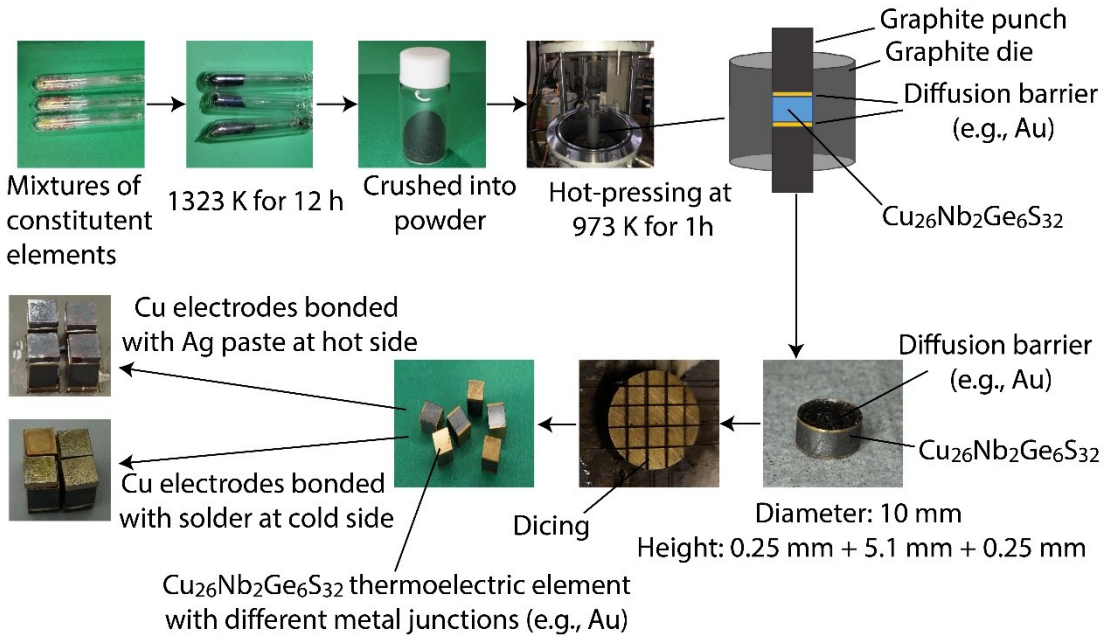

Figure S1

Preparation of $Cu_{26}Nb_2Ge_6S_{32}$ thermoelectric elements with different metal junctions.

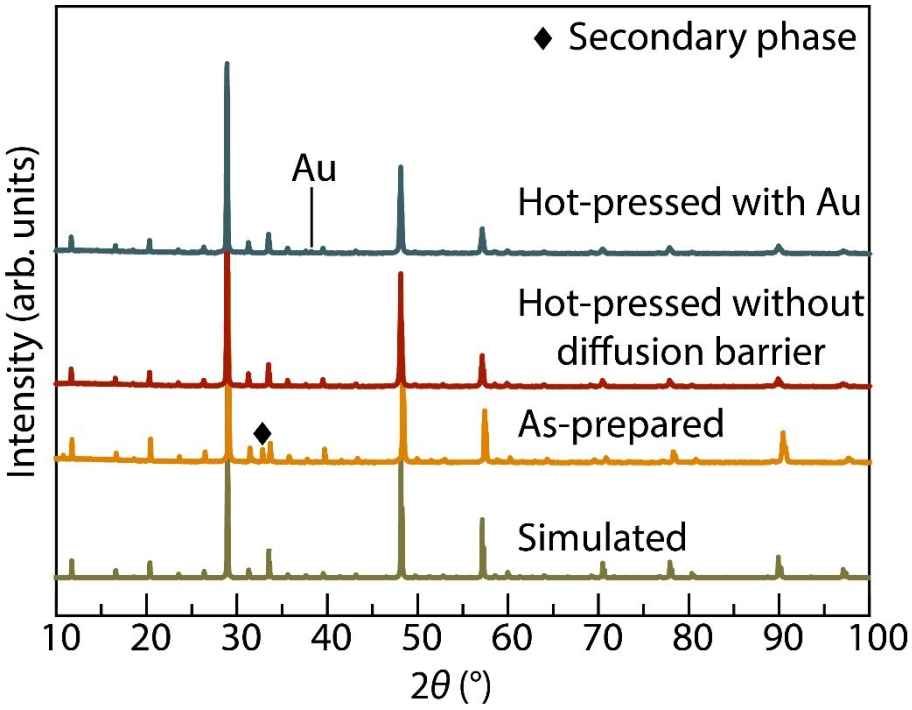

Figure S2

Powder X-ray diffraction patterns of simulated, as-prepared $Cu_{26}Nb_2Ge_6S_{32}$, hot-pressed $Cu_{26}Nb_2Ge_6S_{32}$ without diffusion barrier, and hot-pressed $Cu_{26}Nb_2Ge_6S_{32}$ with Au over the range of 10°–100°.

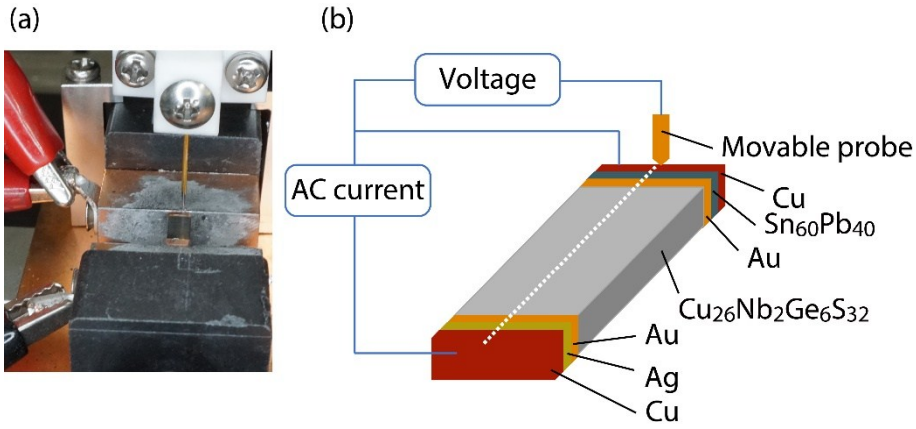

Figure S3

(a) Photograph of sample mounted and (b) a schematic diagram for the electrical resistance (*R*) measurement setup.

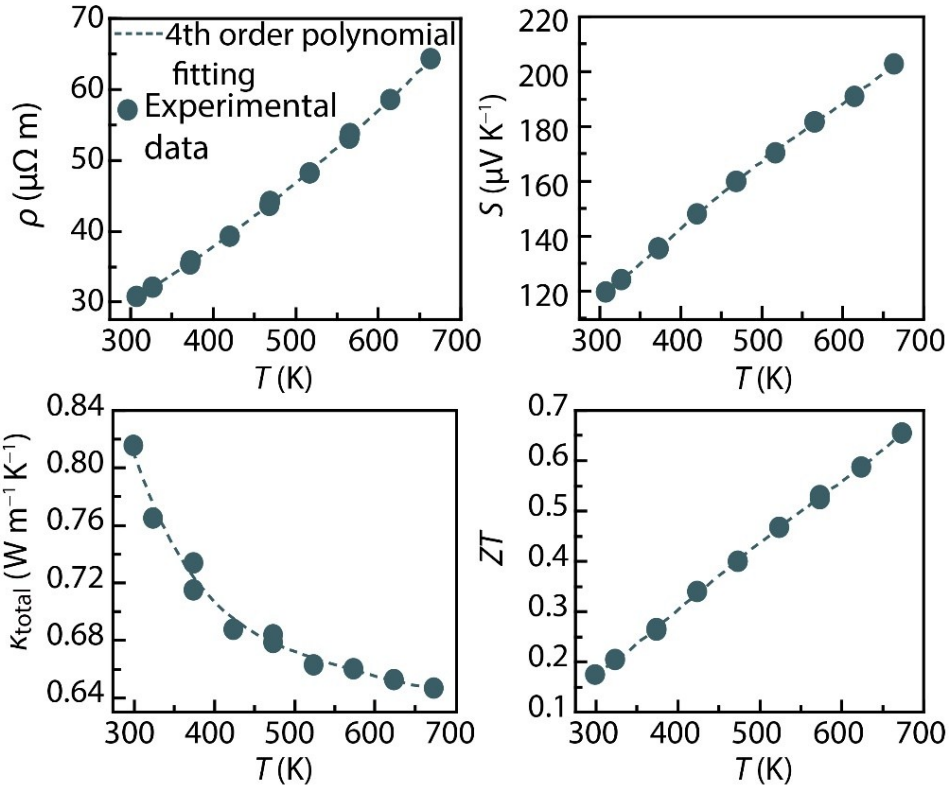

Figure S4

Fourth order polynomial fittings of temperature dependent electrical resistivity (ρ), Seebeck coefficient (S), total thermal conductivity (κ_{total}) and thermoelectric figure of merit (ZT).

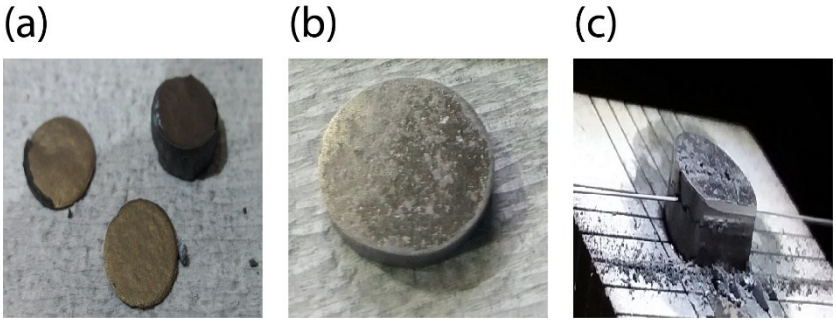

Figure S5

(a) Hot-pressed sample of Ti foil/$Cu_{26}Nb_2Ge_6S_{32}$/Ti foil after hot pressing at 973 K. Ti foil was peeled off. (b) hot-pressed sample of Ti powder/$Cu_{26}Nb_2Ge_6S_{32}$/Ti powder after hot pressing at 973 K. (c) The Ti layer peeled off during the dicing.

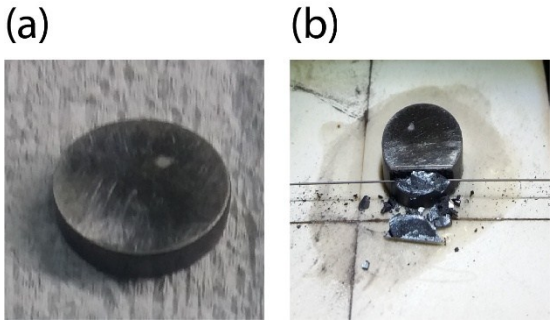

Figure S6

(a) Hot-pressed sample of Pt foil/$Cu_{26}Nb_2Ge_6S_{32}$/Pt foil after hot pressing at 973 K. (b) The Pt layer was peeled off during the dicing.

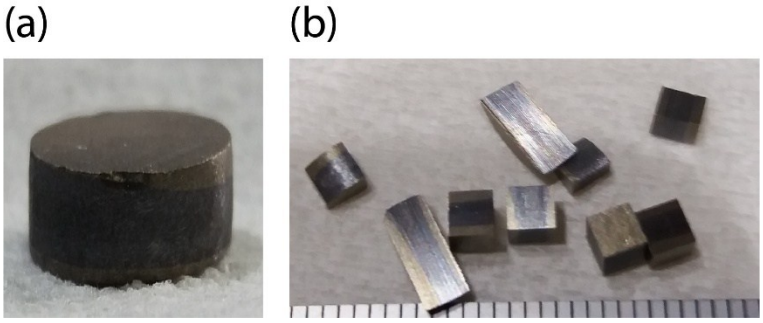

Figure S7

(a) Hot-pressed sample of Ni powder/$Cu_{26}Nb_2Ge_6S_{32}$/Ni powder sample after hot pressing at 923 K. (b) Hot pressed elements of Ni powder/$Cu_{26}Nb_2Ge_6S_{32}$/Ni powder after dicing.

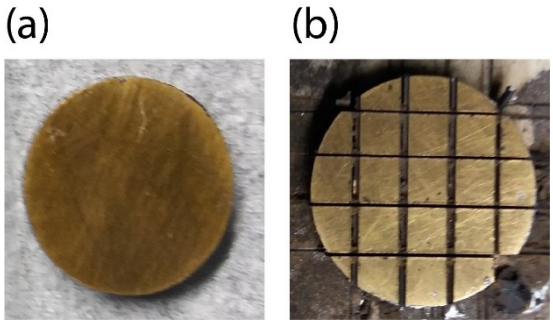

Figure S8

(a) Hot-pressed sample of Au foil/$Cu_{26}Nb_2Ge_6S_{32}$/Au foil after hot pressing at 973 K.(b) Hot pressed elements of Au foil/$Cu_{26}Nb_2Ge_6S_{32}$/Au foil after the dicing.

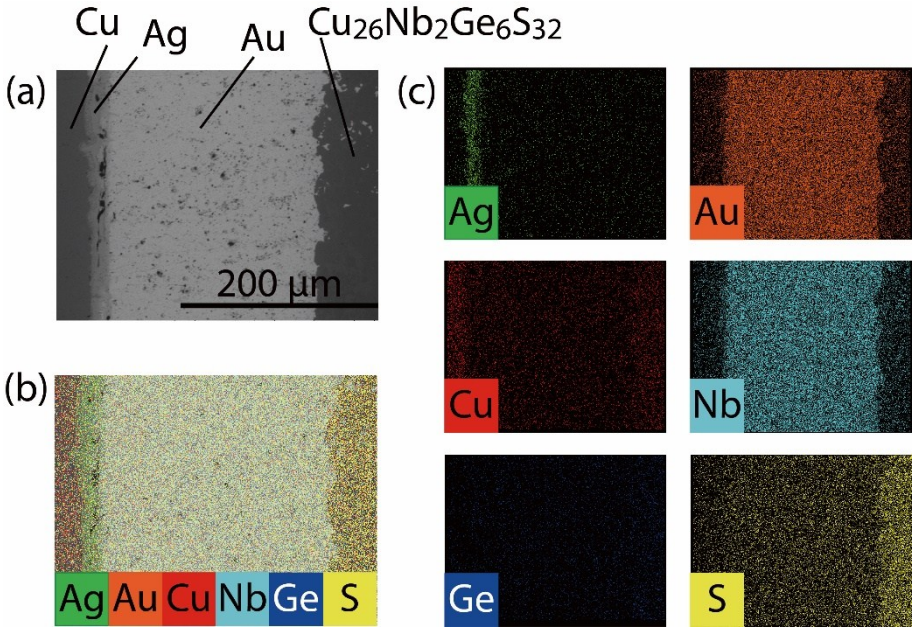

Figure S9

(a) Scanning electron microscopy backscattered electron (SEM-BSE) image of Cu/Ag/Au/$Cu_{26}Nb_2Ge_6S_{32}$ interface in hot side, and (c) and (d) the corresponding X-ray maps of Cu, Ag, Au and $Cu_{26}Nb_2Ge_6S_{32}$. Note that the energy of Nb $L\alpha_1$ = 2.169 keV is close to the energy of Au $M\alpha_1$ =2.123 keV.

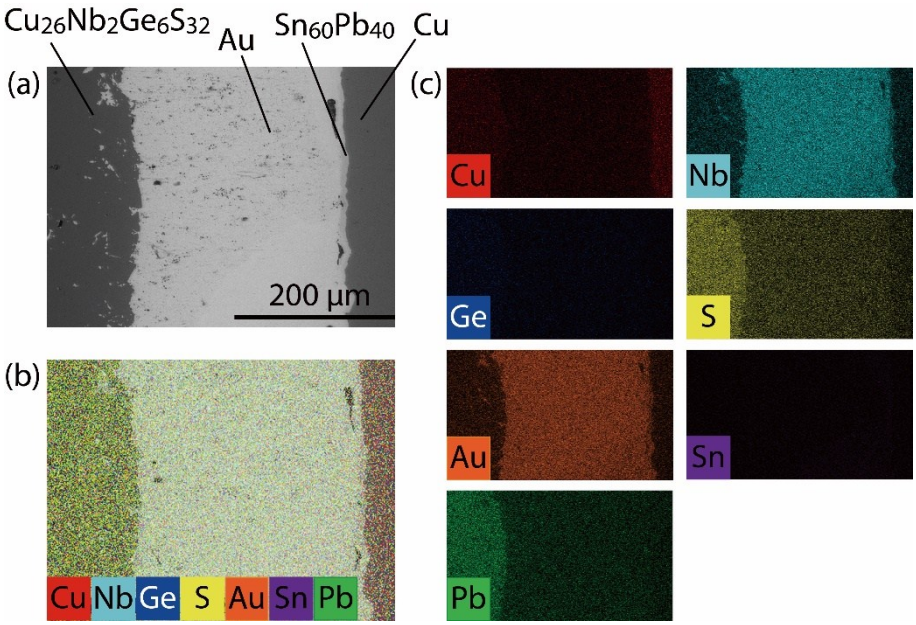

Figure S10

(a) Scanning electron microscopy backscattered electron (SEM-BSE) image of $Cu_{26}Nb_2Ge_6S_{32}$/Au/ $Sn_{60}Pb_{40}$/Cu interface in cold side, and (c) and (d) the corresponding X-ray maps of Au, $Cu_{26}Nb_2Ge_6S_{32}$, Sn, Pb and Cu. Note that the energy of S $K\alpha_1$ = 2.309 keV is close to the energy of Pb $M\alpha_1$ =2.342 keV.

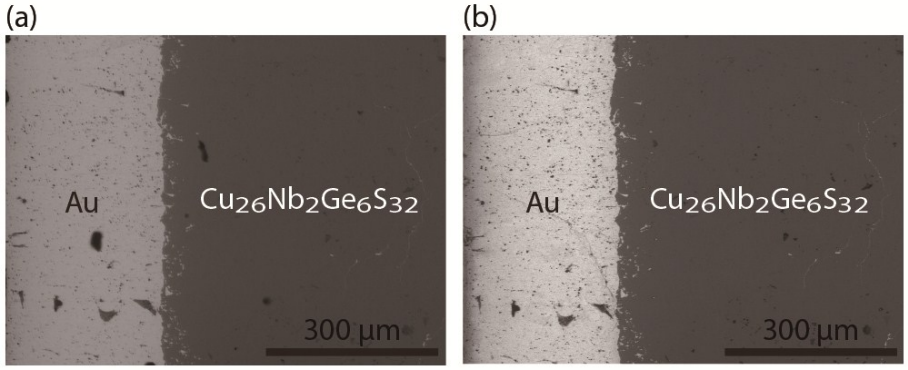

Figure S11

Scanning electron microscopy backscattered electron (SEM-BSE) image of Au/$Cu_{26}Nb_2Ge_6S_{32}$ interface at the hot side of thermoelectric element (a) before and (b) after the temperature gradient treatment, respectively.