

## Supplementary Information

### Skutterudite with Graphene-modified Grain-boundary Complexion Enhances $zT$ Enabling High-efficiency Thermoelectric Device

\* Corresponding author: [cld@mail.sic.ac.cn](mailto:cld@mail.sic.ac.cn), [jeff.snyder@northwestern.edu](mailto:jeff.snyder@northwestern.edu)

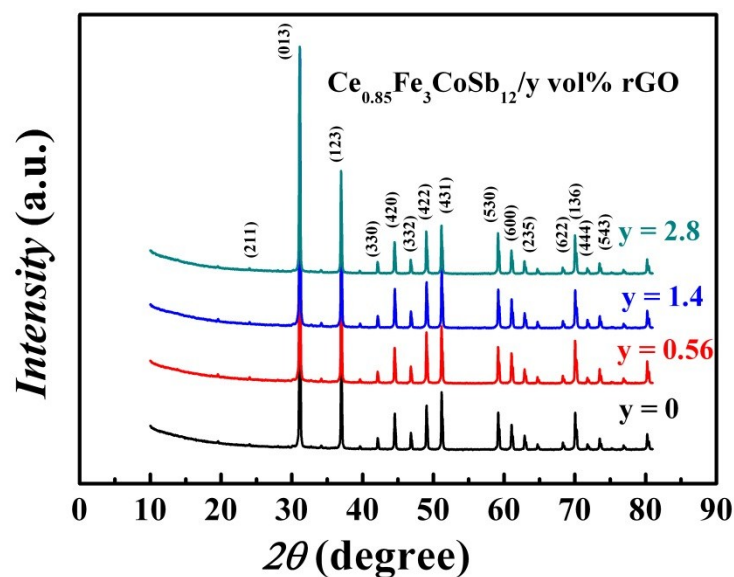


Fig. S1 Powder X-ray diffraction patterns of the  $\text{Ce}_{0.85}\text{Fe}_3\text{CoSb}_{12}/y \text{ vol\% rGO}$  ( $y = 0, 0.56, 1.4, 2.8$ )

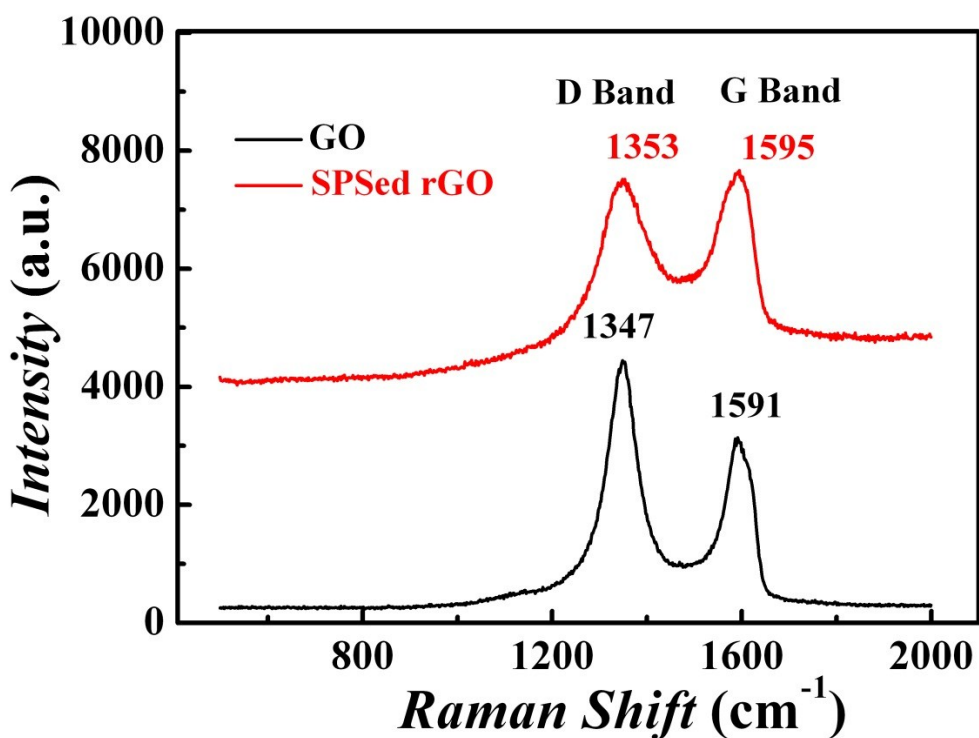


Fig. S2 Raman Spectra of GO and 850K-SPSed rGO

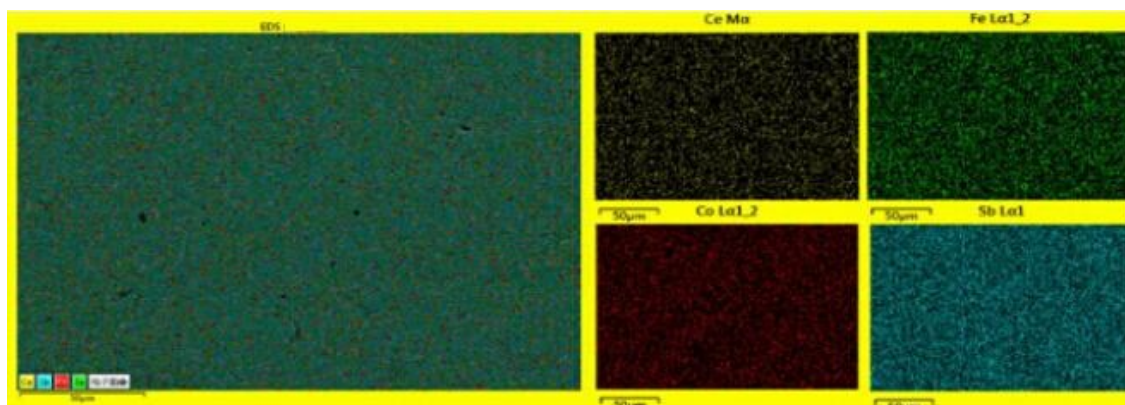


Fig. S3 The EDS image of bulk  $Ce_{0.85}Fe_3CoSb_{12}/y$  vol% rGO ( $y = 2.8$ ).

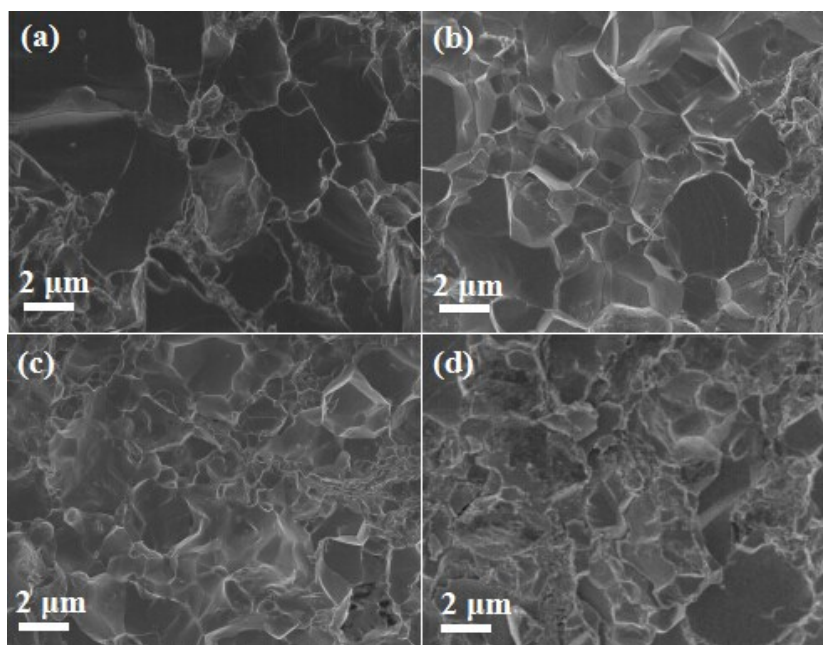


Fig. S4 (a-d) The surface SEM image of bulk  $Ce_{0.85}Fe_3CoSb_{12}/y$  vol% rGO ( $y = 0, 0.56, 1.4, 2.8$ )

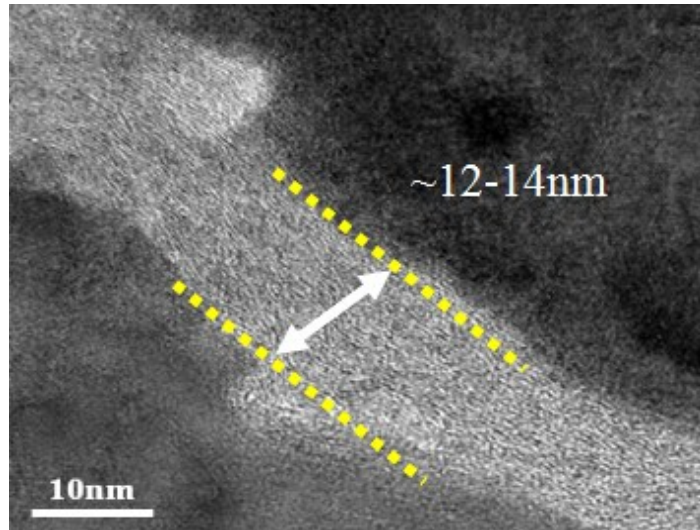


Fig. S5 The cross section HRTEM image of bulk  $\text{Ce}_{0.85}\text{Fe}_3\text{CoSb}_{12}/2.8$  vol% rGO

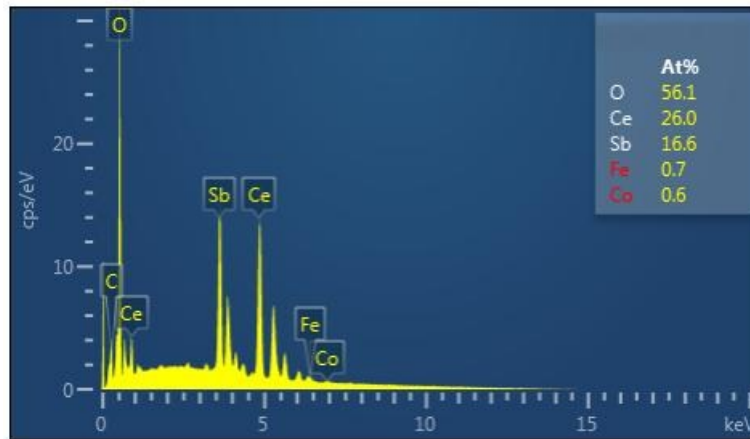


Fig. S6 EDS of the nano precipitate in Fig. 2d

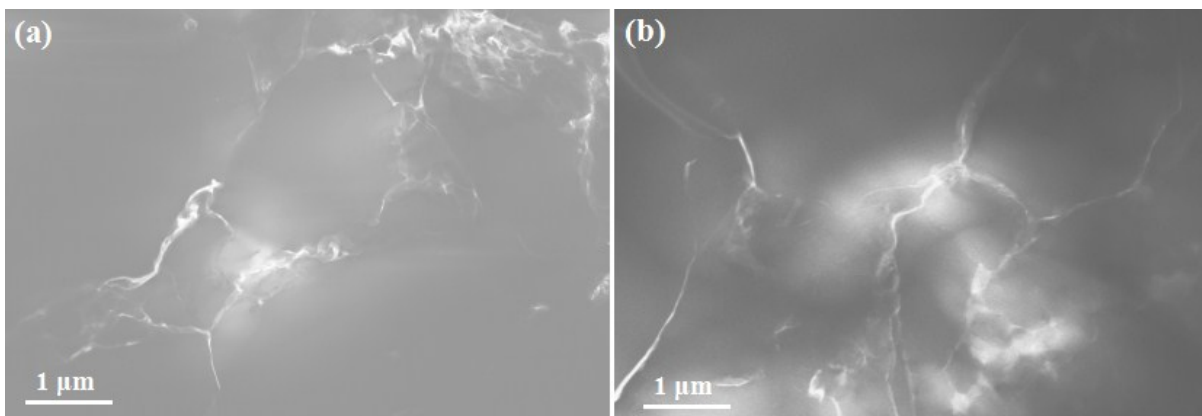


Fig. S7 HAADF-STEM image of the p-type  $\text{Ce}_{0.85}\text{Fe}_3\text{CoSb}_{12}/0.56$  vol% rGO wrapping sample

Table S1. Comparison of the carrier concentration ( $p$ ), mobility ( $\mu$ ), electrical conductivity ( $\sigma$ ), hall coefficient ( $R_H$ ), Seebeck coefficient ( $S$ ) and power factor ( $PF$ ) of  $\text{Ce}_{0.85}\text{Fe}_3\text{CoSb}_{12}/y$  vol % rGO ( $y = 0, 0.56, 1.4, 2.8$ ) at 300 K.

<b>Samples</b> <b>(vol% rGO)</b>	<b><math>p</math></b> <b>(<math>10^{20} \text{ cm}^{-3}</math>)</b>	<b><math>\mu</math></b> <b>(<math>\text{cm}^2\text{V}^{-1}\text{s}^{-1}</math>)</b>	<b><math>\sigma</math></b> <b>(<math>10^5\text{Sm}^{-1}</math>)</b>	<b><math>R_h</math></b> <b>(<math>10^{-2}\text{cm}^3\text{C}^{-1}</math>)</b>	<b><math>S</math></b> <b>(<math>\mu\text{VK}^{-1}</math>)</b>	<b><math>PF</math></b> <b>(<math>\mu\text{Wcm}^{-1}\text{K}^{-2}</math>)</b>
<b>0</b>	19.6	3.6	1.11	0.32	109.9	13.5
<b>0.56</b>	20.7	3.3	1.10	0.30	112.4	14.0
<b>1.40</b>	22.1	3.1	1.09	0.28	116.8	15.0
<b>2.80</b>	27.3	2.3	1.00	0.22	112.5	12.7