Supplementary Information

Preferential phonon scattering and low energy carrier filtering by interfaces of *in-situ* formed InSb nanoprecipitates and GaSb nanoinclusions for enhanced thermoelectric performance in $In_{0.2}Co_4Sb_{12}$

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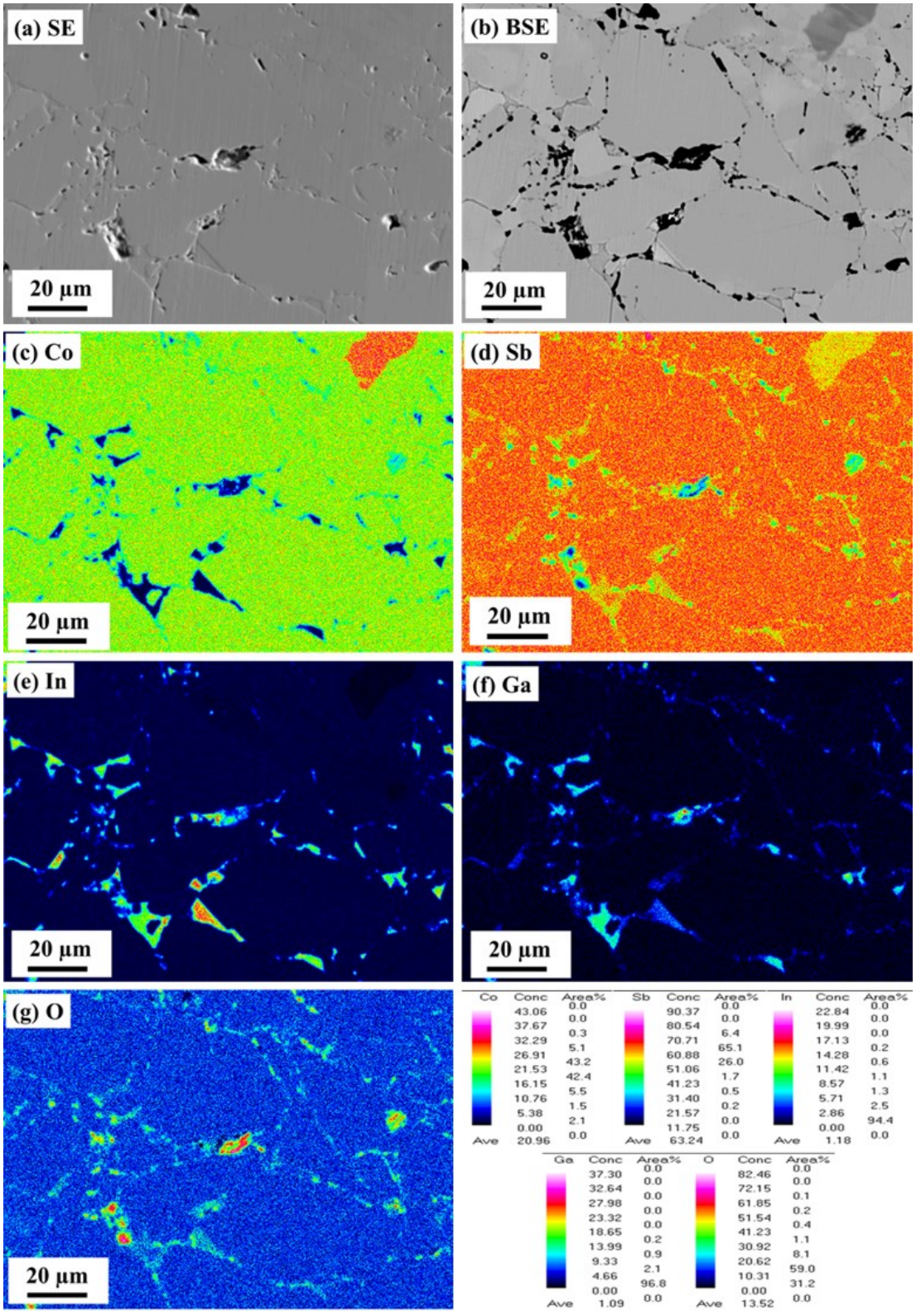

Figure S1 (a)SE micrograph, (b) BSE micrograph of $(GaSb)_{0.2}+In_{0.2}Co_4Sb_{12}$, EPMA-WDS elemental mapping of (c) Co, (d) Sb, (e) In, (f) Ga and (f) O.

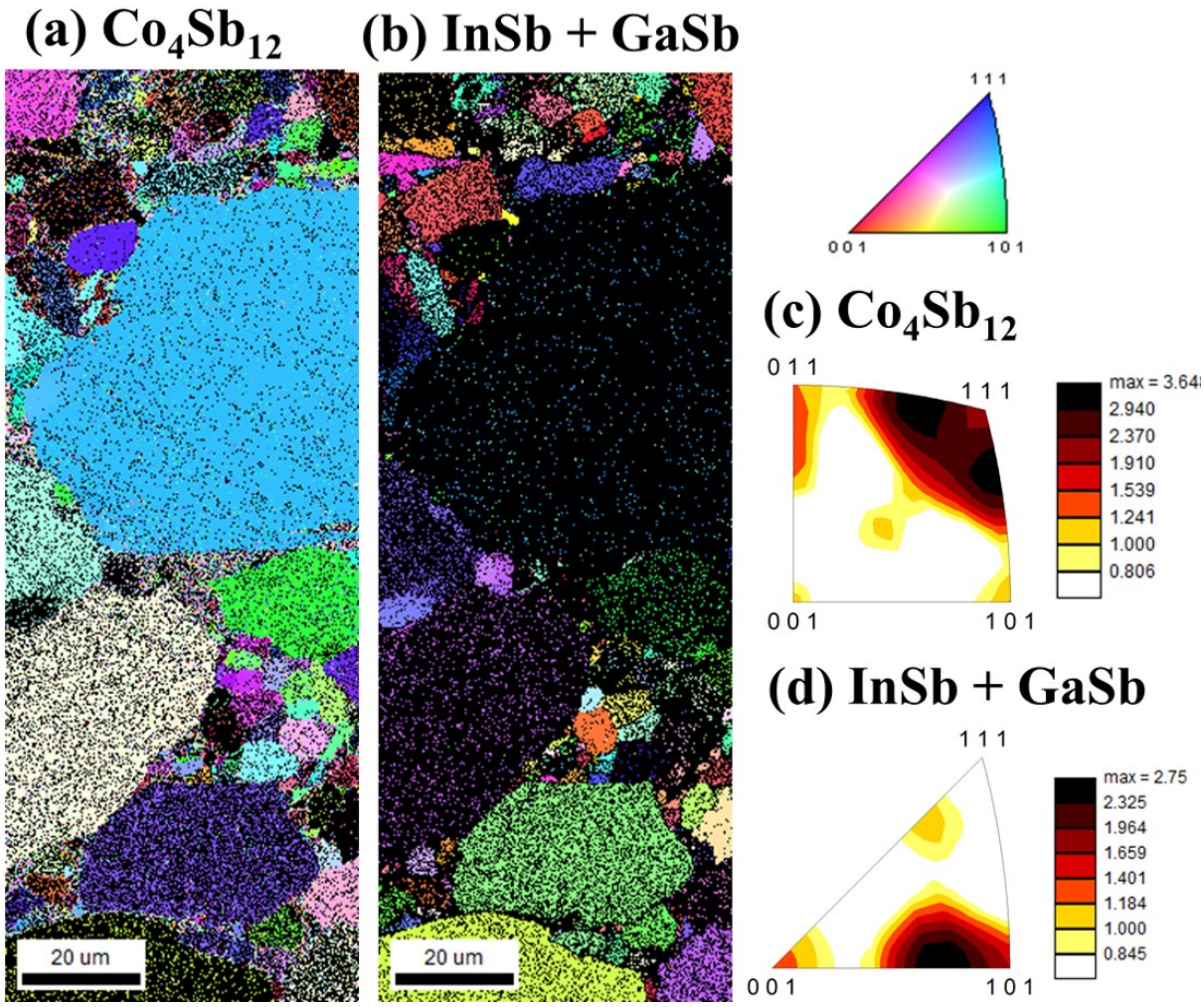

Figure S2 Inverse pole figure (IPF) map of (a) Co_4Sb_{12}, (b) InSb and GaSb phase showing grain size and their distribution, normal direction (ND) IPF of (c) Co_4Sb_{12}, (d) GaSb and InSb phase of $(GaSb)_{0.1}+In_{0.2}Co_4Sb_{12}$.

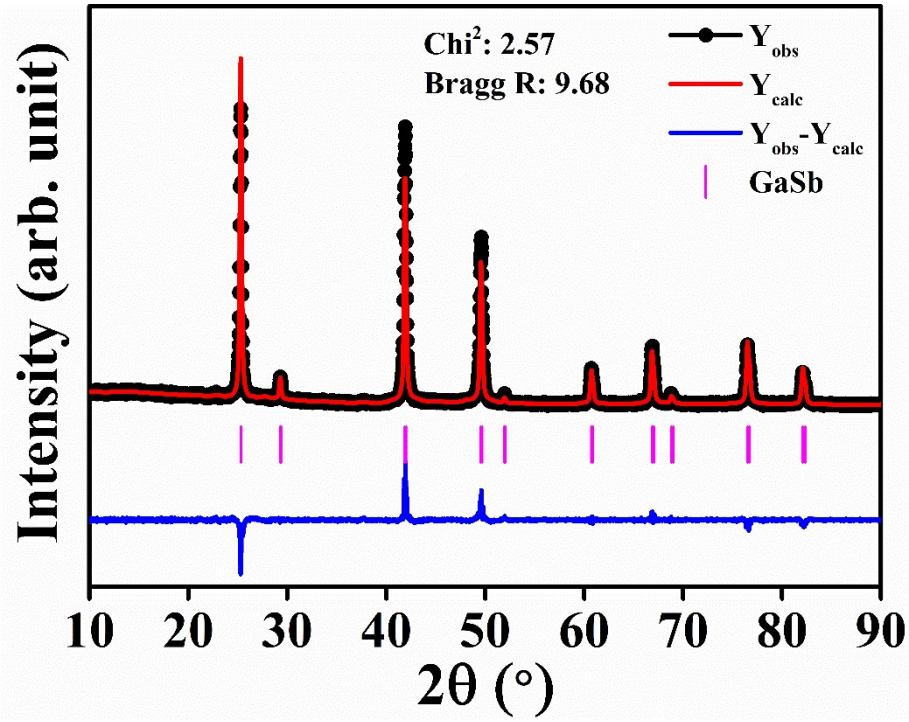

Figure S3 Rietveld refinement analysis of powder XRD pattern of ball-milled GaSb.

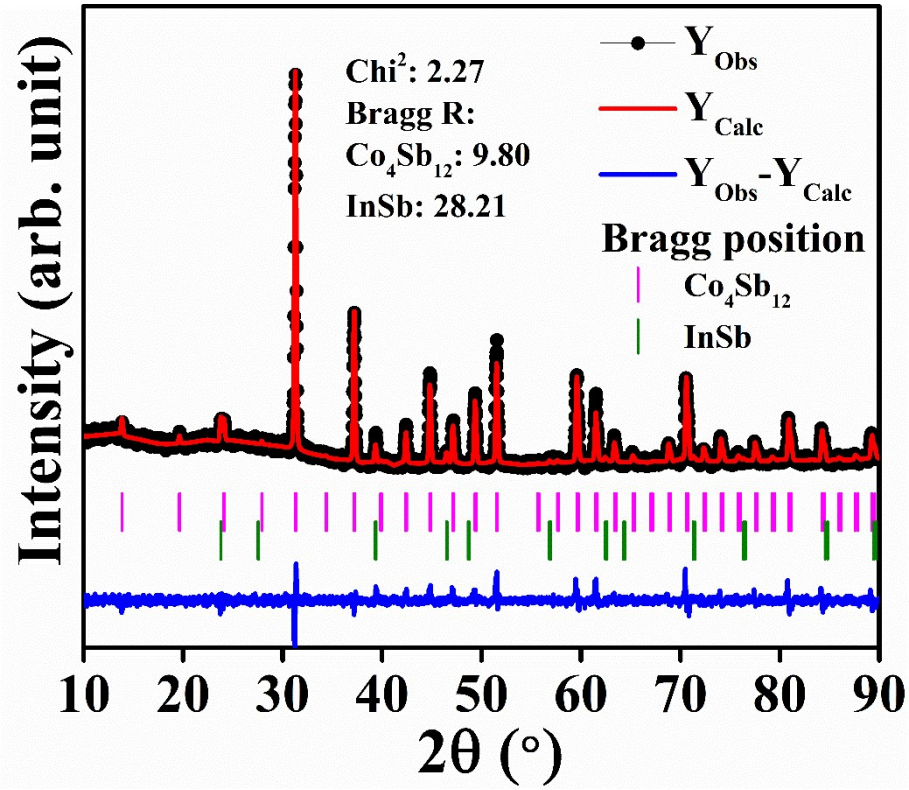

Figure S4 Rietveld refinement analysis of powder XRD pattern of $In_{0.2}Co_4Sb_{12}$.

Table S1 Rietveld refinement parameters of matrix $In_{0.2}Co_4Sb_{12}$.

Atom	Wyckoff site	x	y	z	U_{iso}(Å^2)	Normalized site occupancy
Co	8c	0.25	0.25	0.25	0.009(1)	1
Sb	24g	0	0.15(7)	0.33(6)	0.005(6)	1
In	2a	0	0	0	0.029(5)	0.24(9)

The composition of the matrix from Rietveld refinement: $In_{0.24(9)}Co_4Sb_{12}$.

Table S2 Rietveld refinement parameters of $(GaSb)_{0.1}$+$In_{0.2}Co_4Sb_{12}$.

Atom	Wyckoff site	x	y	z	U_{iso}(Å^2)	Normalized site occupancy
Co	8c	0.25	0.25	0.25	0.004(2)	1
Sb	24g	0	0.15(7)	0.33(5)	0.006(3)	0.97(3)
In	2a	0	0	0	0.068(1)	0.26(4)

The composition of the primary phase of the composite from Rietveld refinement: $In_{0.26(4)}Co_4Sb_{11.67(9)}$.

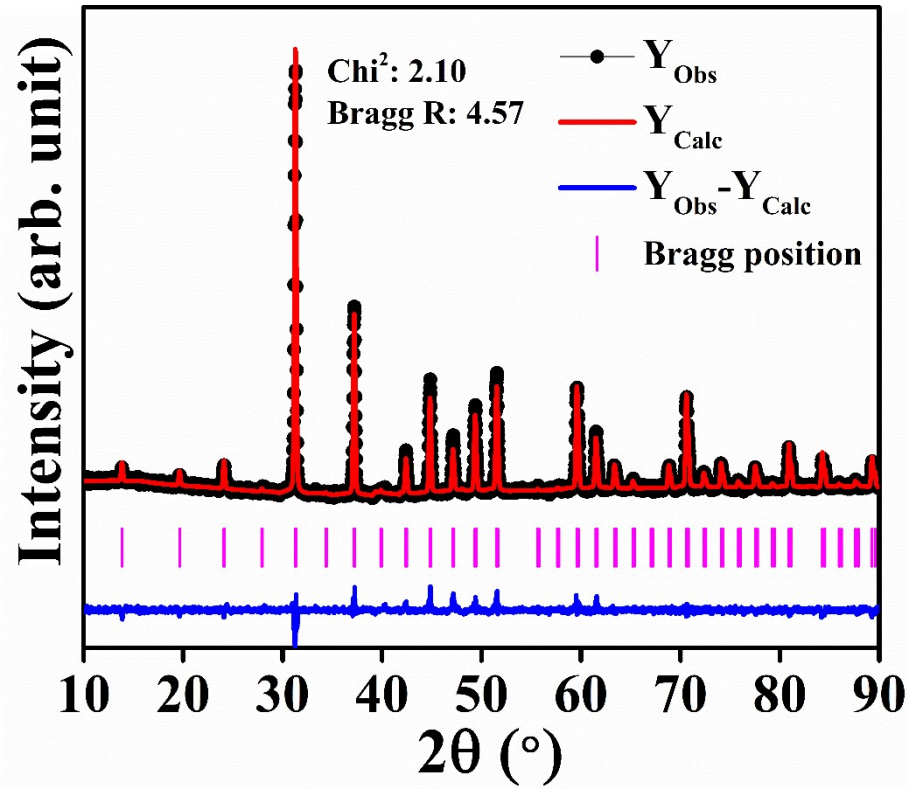

Figure S5 Rietveld refinement analysis of powder XRD pattern of $(GaSb)_{0.2}$+$In_{0.2}Co_4Sb_{12}$.

Table S3 Rietveld refinement parameters of $(GaSb)_{0.2}$+$In_{0.2}Co_4Sb_{12}$.

Atom	Wyckoff site	x	y	z	U_{iso}(Å^2)	Normalized site occupancy
Co	8c	0.25	0.25	0.25	0.006(1)	1
Sb	24g	0	0.15(8)	0.33(4)	0.006(1)	0.97(8)
In	2a	0	0	0	0.043(6)	0.22(5)

The composition of the primary phase of the composite from Rietveld refinement: $In_{0.22(5)}Co_4Sb_{11.74(1)}$.

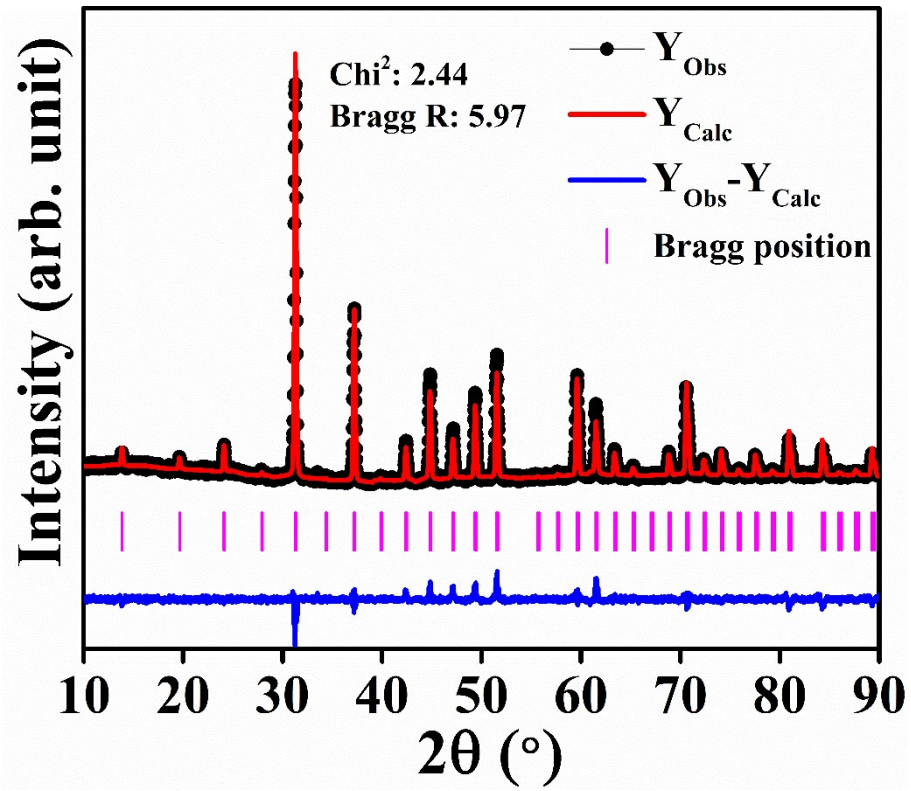

Figure S6 Rietveld refinement analysis of powder XRD pattern of $(GaSb)_{0.3}$+$In_{0.2}Co_4Sb_{12}$.

Table S4 Rietveld refinement parameters of $(GaSb)_{0.3}$+$In_{0.2}Co_4Sb_{12}$.

Atom	Wyckoff site	x	y	z	U_{iso}(Å^2)	Normalized site occupancy
Co	8c	0.25	0.25	0.25	0.009(6)	1
Sb	24g	0	0.15(7)	0.33(5)	0.005(3)	0.99(1)
In	2a	0	0	0	0.015(9)	0.23(5)

The composition of the primary phase of the composite from Rietveld refinement: $In_{0.23(5)}Co_4Sb_{11.88(9)}$.

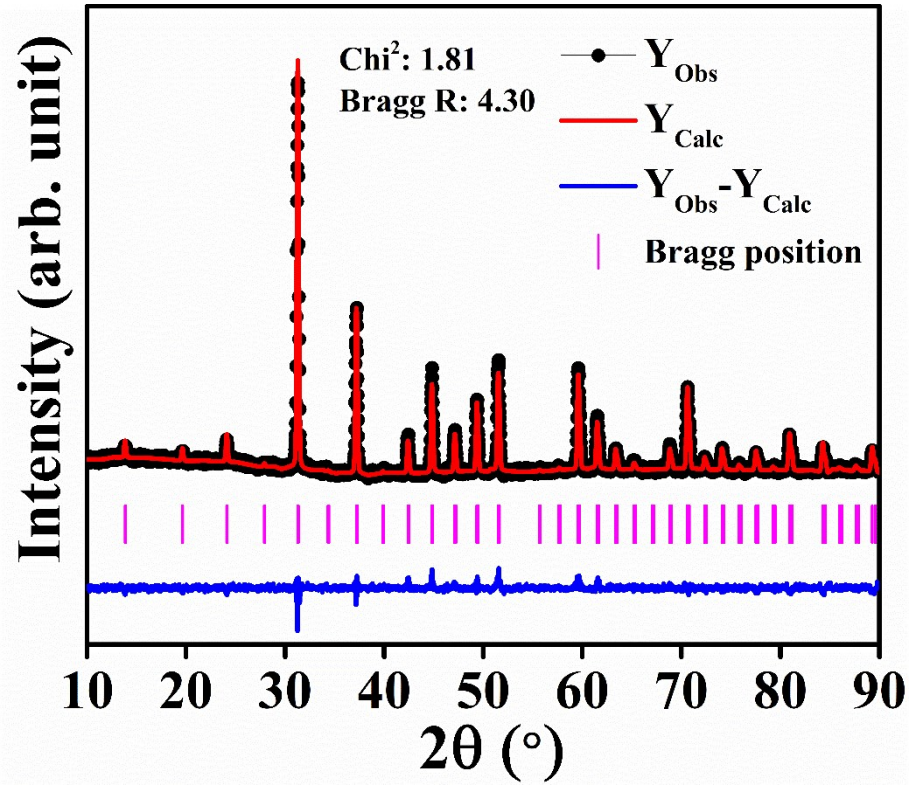

Figure S7 Rietveld refinement analysis of powder XRD pattern of $(GaSb)_{0.4}+In_{0.2}Co_4Sb_{12}$.

Table S5 Rietveld refinement parameters of $(GaSb)_{0.4}+In_{0.2}Co_4Sb_{12}$.

Atom	Wyckoff site	x	y	z	U_{iso}(Å^2)	Normalized site occupancy
Co	8c	0.25	0.25	0.25	0.007(5)	1
Sb	24g	0	0.15(7)	0.33(4)	0.006(2)	0.98(3)
In	2a	0	0	0	0.053(9)	0.20(3)

The composition of the primary phase of the composite from Rietveld refinement: $In_{0.20(3)}Co_4Sb_{11.80(1)}$.

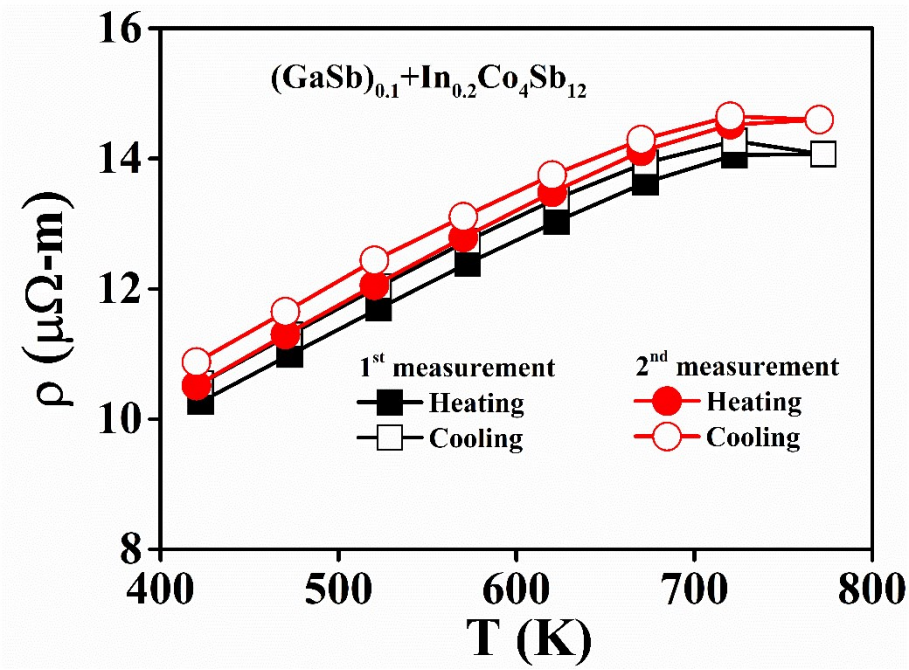

Figure S8 Temperature dependence of electrical resistivity of $(GaSb)_{0.1}+In_{0.2}Co_4Sb_{12}$.

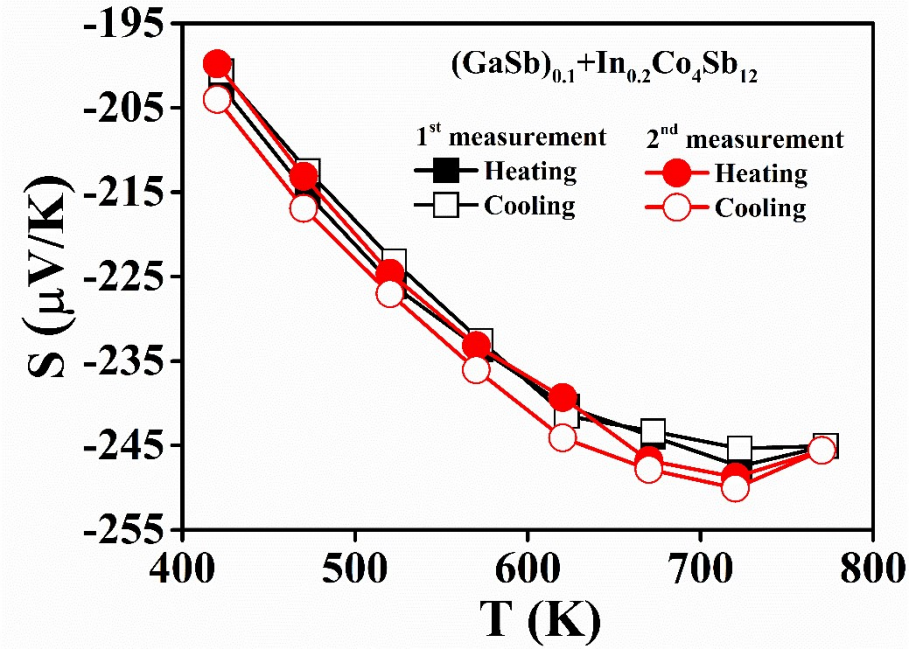

Figure S9 Temperature dependence of Seebeck coefficient of $(GaSb)_{0.1}+In_{0.2}Co_4Sb_{12}$.

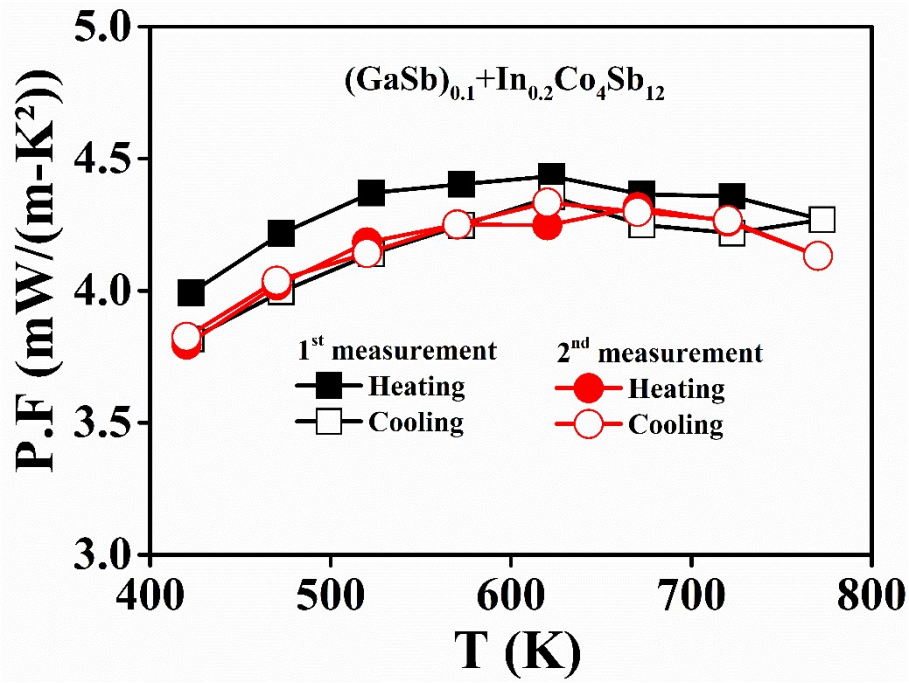

Figure S10 Temperature dependence of power factor of $(GaSb)_{0.1}+In_{0.2}Co_4Sb_{12}$.