Electronic Supplementary Material (ESI) for Dalton Transactions.

Thermal conductivity of PbTe-$CoSb_3$ bulk polycrystalline composite: the role of microstructure and interface thermal resistance

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Table S1. Milling parameters for preparation of PbTe and $CoSb_3$ powders

~300 μm ($CoSb_3$)	Hand grinding in a mortar, sieving (<300μm, >100μm) and decantation of the solution in isopropanol to separate the desired fraction from residual small grains		
~30 μm ($CoSb_3$ and PbTe)	Ball milling (agate jar and balls ϕ=10mm)	500 rpm	15 minutes
~1 μm ($CoSb_3$)	Ball milling (agate jar and balls ϕ=3mm)		6 hours

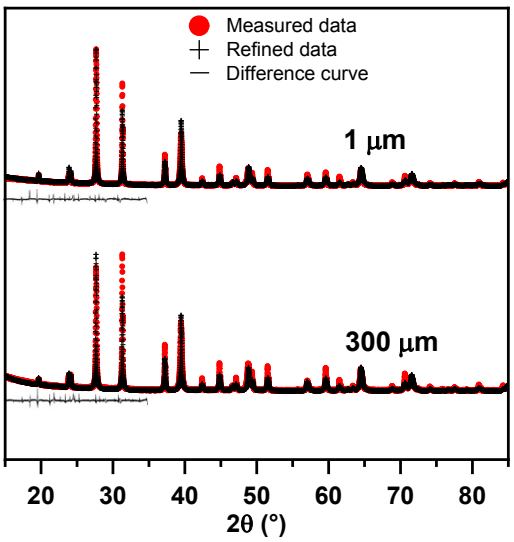

Figure S1. XRD patterns and Rietveld refinement results for the (0.5)PbTe/(0.5)$CoSb_3$ composite for different grain sizes of $CoSb_3$ phase

Lorenz number calculation

Table S2. Material parameters used for calculation of the Lorenz number.

	PbTe [1][2]	**$CoSb_3$** [3]
Effective mass	$0.24m_e$	$4m_e$
Band gap [eV]	0.31	0.06

Nonparabolicity of the bands in PbTe and $CoSb_3$ has an impact on the electronic contribution to lattice thermal conductivity [4,5]. Thus, the Kane band model [1][6] was used for calculation of the Lorenz number with the following equations:

$$L_0(\eta,\beta) = \left(\frac{k_B}{e}\right)^2 \left[\frac{I^{\,2}_{r+1,2}(\eta,\beta)}{I^{\,0}_{r+1,2}(\eta,\beta)} - \left(\frac{I^{\,1}_{r+1,2}(\eta,\beta)}{I^{\,0}_{r+1,2}(\eta,\beta)}\right)\right], \quad (1)$$

where k_B and e denote Boltzmann constant and elementary charge, $I^{m}_{n,k}(\eta,\beta)$ is the three-parametric Fermi integral:

$$I^{m}_{n,k}(\eta,\beta) = \int_0^{\infty} \frac{e^{x-\eta} x^m (x+\beta x^2)^n}{(1+e^{x-\eta})^2 (1+2\beta x)^k} dx, \quad (2)$$

where $\eta = \mu/k_B T$, $\beta = k_B T/E_g$, T is the temperature, E_g is a band gap, μ is the chemical potential, which could be defined as:

$$\mu = \frac{k_B}{e} T \cdot \ln\left(\frac{N_v}{n}\right), \quad (3)$$

$$N_v = 2\left(\frac{2\pi m^* k_B T}{h^2}\right)^{\frac{3}{2}}, \quad (4)$$

where N_v is the density of states, m^* is the effective mass, h is Planck's constant and n is the concentration of electrons.

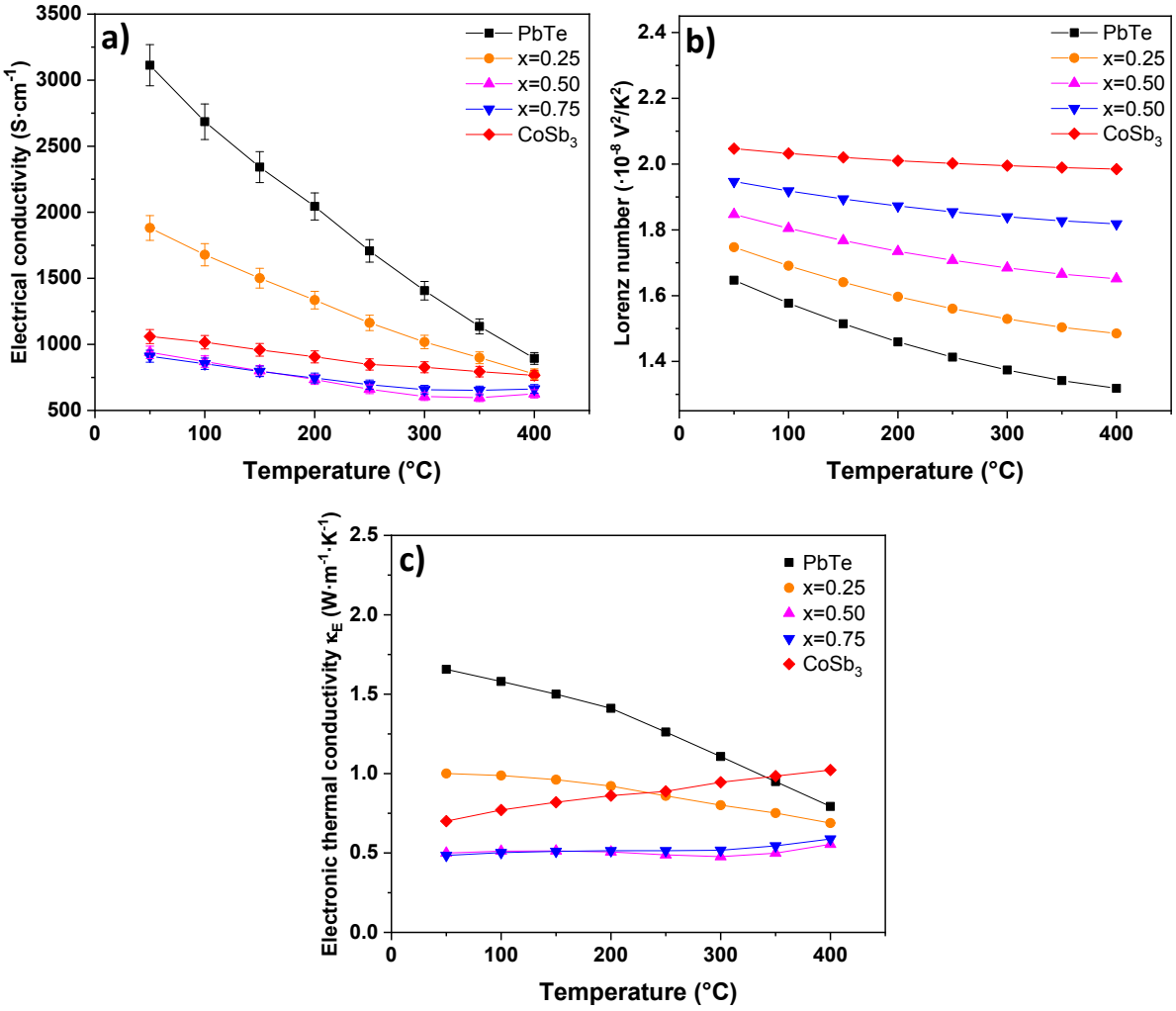

Figure S2. a) Electrical conductivity b) Lorenz number and c) electronic thermal conductivity as a function of temperature in (1-*x*)PbTe/(*x*)$CoSb_3$ composite for 0≤x≤1