Supporting Information

Enhancing the Thermoelectric Performance of Polycrystalline SnSe by Decoupling Electrical and Thermal Transport through Carbon Fibre Incorporation

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S1: Lorenz number calculation

In general, the total thermal conductivity ($\kappa$) consists of the electronic thermal conductivity ($\kappa_e$) and the lattice thermal conductivity ($\kappa_L$). The electronic part $\kappa_e$ is directly proportional to the electrical conductivity $\sigma$ through the Wiedemann-Franz relation, $\kappa_e = L \sigma T$, where $L$ is the Lorentz number and its value is calculated by the single parabolic band (SPB) model. The Lorenz number can be given as:

$$L = \left( \frac{k_B}{e} \right) \frac{(r + 7/2) F_{r+5/2}(\eta)}{(r + 3/2) F_{r+3/2}(\eta)} \left( \frac{(r + 5/2) F_{r+3/2}(\eta)}{(r + 3/2) F_{r+1/2}(\eta)} \right)^2$$  \hspace{1cm} (1)

For the Lorenz number calculation, we should get reduced Fermi energy $\eta$ firstly; the calculation of $\eta$ can be derived from the measured Seebeck coefficients by using the following relationship:

$$S = \pm \frac{k_B}{e} \left( \frac{(r + 5/2) F_{r+3/2}(\eta)}{(r + 3/2) F_{r+1/2}(\eta)} - \eta \right)$$  \hspace{1cm} (2)

Where $F_n(\eta)$ is the $n^{th}$ order Fermi integral,

$$F_n(\eta) = \int_{0}^{e} \frac{\chi^n}{1 + e^{\chi - \eta}} d\chi$$  \hspace{1cm} (3)

Where $e$ is the electron charge, $k_B$ is the Boltzmann constant, $h$ is the Planck constant, and $r$ is the scattering factor. Assuming that the carrier scattering mechanism near room temperature is dominated by acoustic phonon scattering $r$ can be taken as -1/2. The Lorenz number can be obtained by combining Equations (1), (2), and (3).
S2. Anisotropic thermoelectric properties of SnSe/CF samples.

**Figure S1.** Thermoelectric properties of SnSe/CF03 measured along parallel (∥ solid symbol) and perpendicular (⊥ open symbol) to the SPS pressure direction: (a) Seebeck coefficient; (b) electrical conductivity; (c) thermal conductivity; (d) zT.
S3. Heat capacity and thermal diffusivity

Figure S2. Temperature dependence of (a) the specific heat capacity ($C_p$) and (b) the thermal diffusivity ($D$) of SnSe and SnSe/CF samples.

S4. Hall carrier density and carrier mobility

Figure S3. Carrier density and carrier mobility as functions of the CF content at 330 K.