# Supplementary Information for

# Anisotropic thermoelectric properties of layered compounds in $SnX_2$ (X = S, Se): A promising thermoelectric

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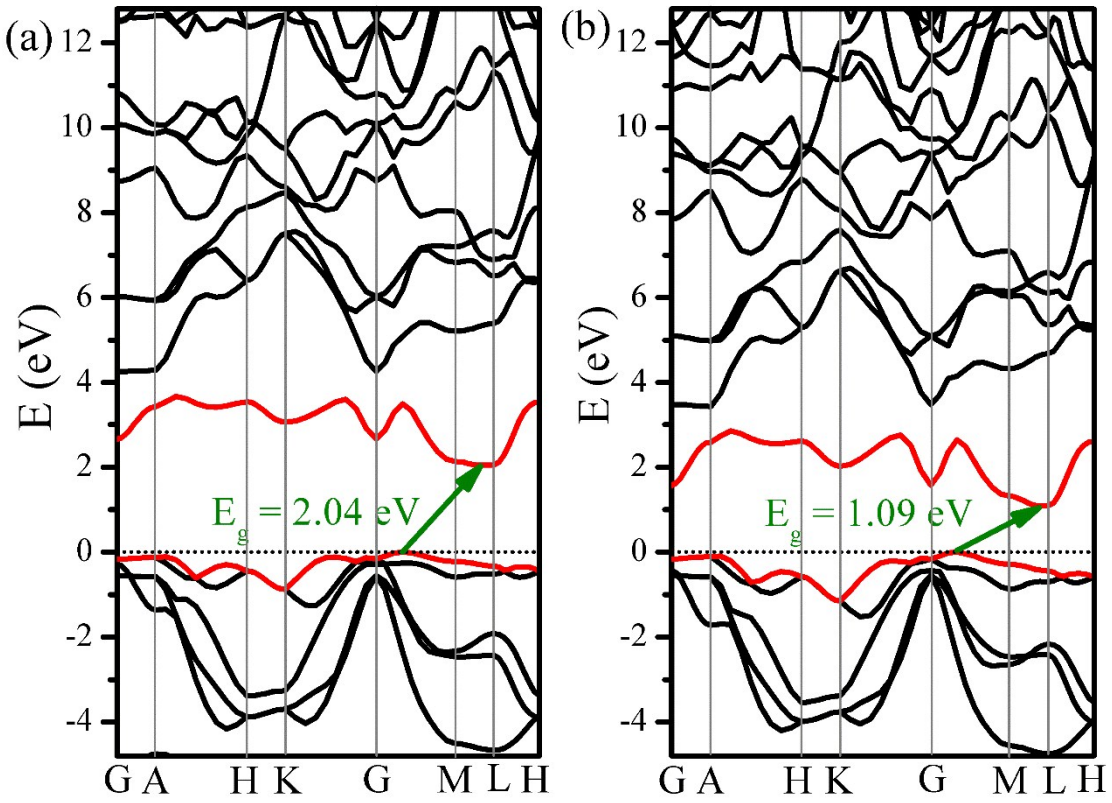


**Fig. S1**. Band structures of $SnS_2$ (a) and $SnSe_2$ (b). Top of the valence band is set to zero. The highest valence band and lowest conduction band are highlighted in red. *G*, *A*, *H*, *K*, *M*, *L* are (0 0 0), (0 0 0.5), (-0.333 0.667 0.5), (-0.333 0.667 0), (0 0.5 0), (0 0.5 0.5) high symmetry points, respectively.

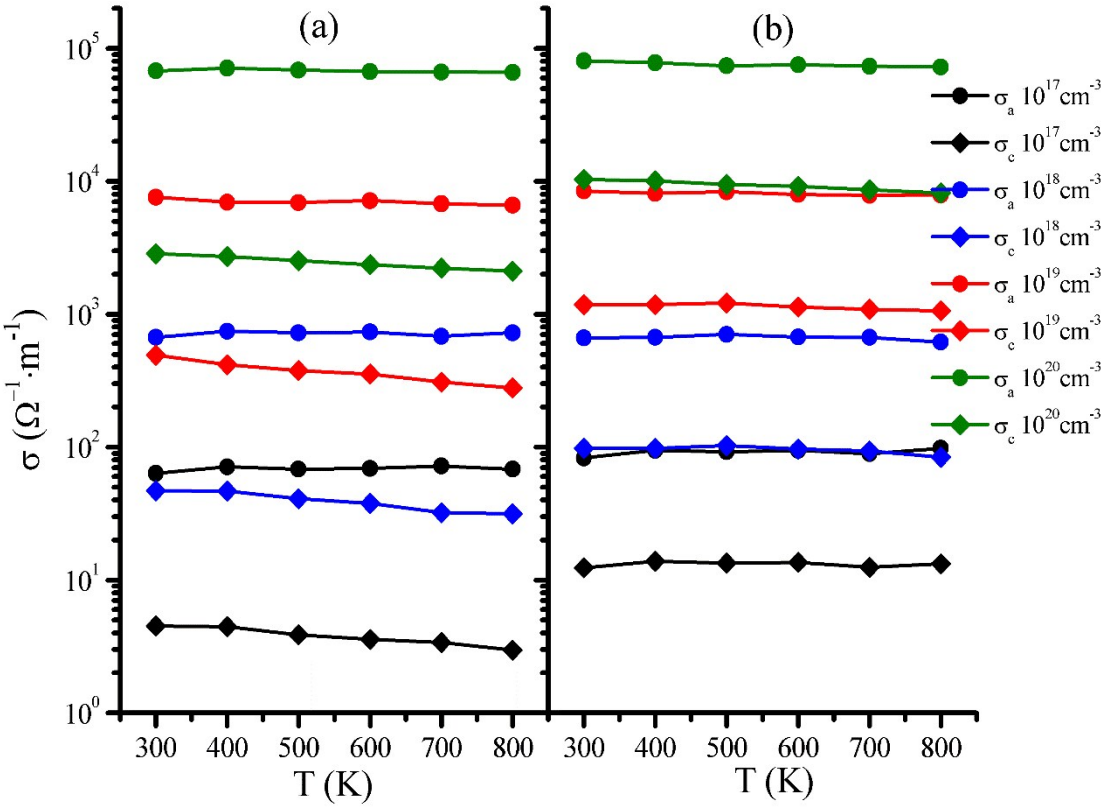


**Fig. S2**. Temperature dependence of the electrical conductivities along the *a* ($\sigma_a$) and *c* ($\sigma_c$) directions in $SnS_2$ (a) and $SnSe_2$ (b) for four different carrier concentrations.

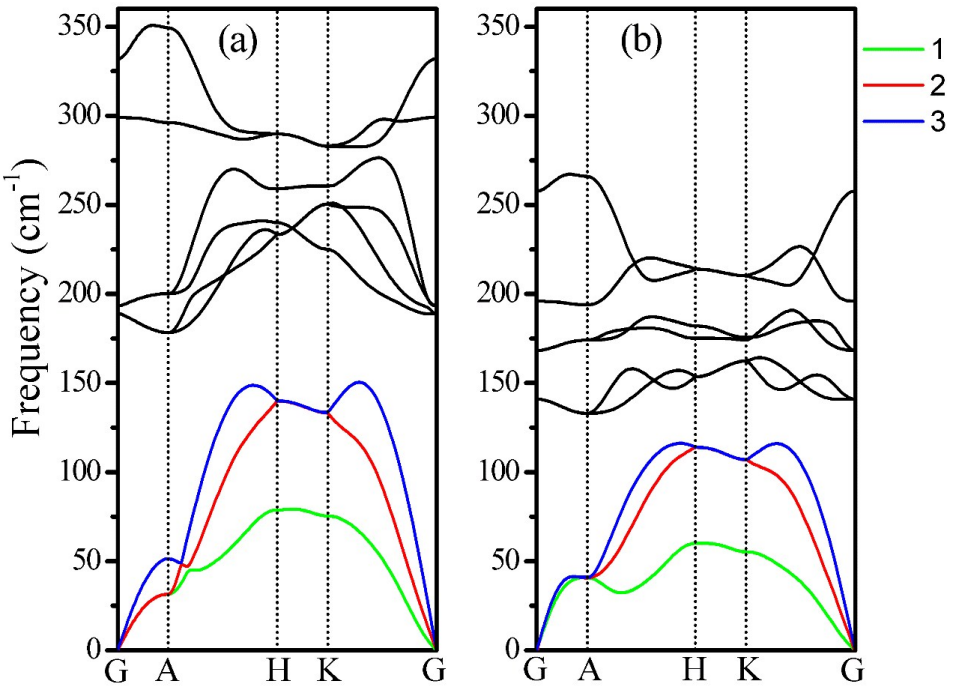


**Fig. S3**. Phonon dispersion of $SnS_2$ (a) and $SnSe_2$ (b). Three acoustic phonon branches are indicated with different colors.

**Table S1** Debye temperatures (Θ) and phonon velocities (ν) along the *a* and *c* axes for $SnS_2$ and $SnSe_2$.

| $SnS_2$ | | | | $SnSe_2$ | | |
|---|---|---|---|---|---|---|
| GK/a | Θ(K) | ν(m/s) | | GK/a | Θ(K) | ν(m/s) |
| 1 | 108 | 1538 | | 1 | 80 | 1327 |
| 2 | 191 | 2902 | | 2 | 153 | 2878 |
| 3 | 216 | 5289 | | 3 | 167 | 4452 |
| Average | 172 | 3243 | | Average | 133 | 2886 |
| GA/c | Θ(K) | ν(m/s) | | GA/c | Θ(K) | ν(m/s) |
| 1 | 45 | 1904 | | 1 | 59 | 2120 |
| 2 | 45 | 1903 | | 2 | 60 | 2270 |
| 3 | 74 | 2899 | | 3 | 60 | 2270 |
| Average | 55 | 2235 | | Average | 60 | 2220 |

Values are calculated from the phonon dispersions (Figure S3). The Debye temperature is calculated using $\Theta = \omega_D/k_B$ ($\omega_D$ is the largest acoustic frequency in each direction); the phonon velocity is the slope of the acoustic phonon dispersion around the *G* point.