**Supporting Information**

**Figure S1: The ingot after annealing showing the copper precipitates**

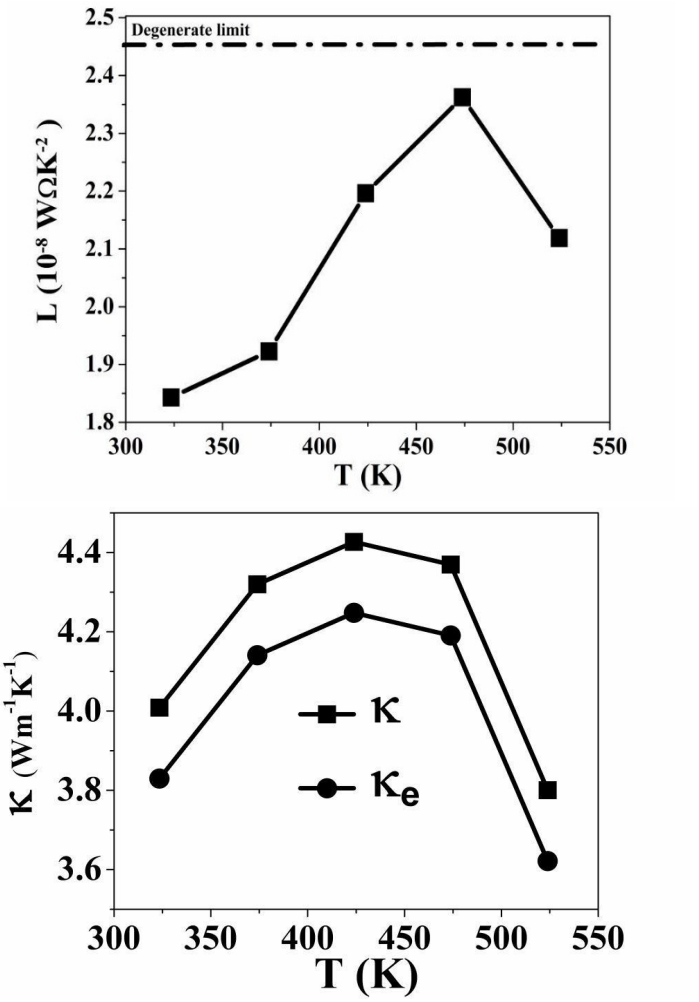


**Figure S2: The Lorenz number (L) and $\kappa_e$ for CT2 calculated using $\kappa_{min}$=0.179 W m$^{-1}$ K$^{-1}$**

**Table S1: Structures and compositions of different phases taken from reference [22]**

| Phase | at. % Te | Temperature (K) | Structure |
|---|---|---|---|
| A | 36.3 | 298 | Cubic |
| B | 33.3 | 298 | Hexagonal |
| C | 33.3 | 298 | Hexagonal |
| | 35.0 | 298 | Hexagonal |
| D | 34.0 | 573 | Orthorhombic |
| E | 33.7 | 298 | Orthorhombic |
| F | 34.0 | 293 | Orthorhombic |
| G | 34.75 | 298 | Orthorhombic |
| H | 36 | 298 | Hexagonal |
| J | 35.3 | 298 | Hexagonal |
| K | 36.05 | 298 | Hexagonal |
| | 36.20 | 298 | Hexagonal |
| M | 41.14 | 653 | - |
| | 41.48 | | |
| N1 | 41.15 | 623 | Hexagonal |
| N2 | 40.15 | 523 | Tetragonal |
| | 41.4 | 445 | Tetragonal |
| N3 | 40.8 | 293 | Orthorhombic |
| | 40.8 | 293 | Orthorhombic |