## Ag doping induced abnormal lattice thermal conductivity in Cu<sub>2</sub>Se

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1. Rietveld refinement calculated Cu<sub>2</sub>O content and its influence on thermoelectric performance of Cu<sub>2</sub>Se

Figure S1a and b show the experimental XRD patterns in comparison with the Rietveld refinement calculated ones of as-sintered (Cu<sub>1-x</sub>Ag<sub>x</sub>)<sub>2</sub>Se pellets and the calculated the Cu<sub>2</sub>O ratios. The R<sub>wp</sub> values for (Cu<sub>1-x</sub>Ag<sub>x</sub>)<sub>2</sub>Se with x=0, 0.005 and 0.01 are 7.9, 6.8 and 7.2 %, respectively. As can be seen, with increasing the Ag-doping level, the Cu<sub>2</sub>O content increases up to 3.5 *at.* %. This fraction is lower than the critical point of ~7 *at.* %.[1] Below this point, Cu<sub>2</sub>O has minor influence on thermoelectric performance of as-prepared (Cu<sub>1-x</sub>Ag<sub>x</sub>)<sub>2</sub>Se.[1]

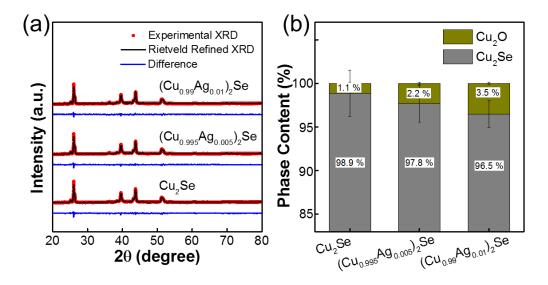


Figure S1. (a) Experimental and Rietveld refinement calculated XRD patterns and (b) Rietveld refinement calculated phase content of as-prepared Cu<sub>2</sub>Se, (Cu<sub>0.995</sub>Ag<sub>0.005</sub>)<sub>2</sub>Se and (Cu<sub>0.99</sub>Ag<sub>0.01</sub>)<sub>2</sub>Se pellets.

2. Temperature-dependent specific heat of as-prepared (Cu<sub>1-x</sub>Ag<sub>x</sub>)<sub>2</sub>Se pellets

The temperature-dependent specific heat  $(C_p)$  of as-prepared  $(Cu_{1-x}Ag_x)_2$ Se pellets are shown in Figure S2 (refer to Figure R2). The peaks at ~400 K of all samples clearly revealed the well-known phase transition from  $\alpha$ -Cu<sub>2</sub>Se to  $\beta$ -Cu<sub>2</sub>Se at ~400 K.[2, 3] Here, we are mainly focusing on thermoelectric performance of  $(Cu_{1-x}Ag_x)_2$ Se pellets after the phase transition where the temperature is higher than 423 K.

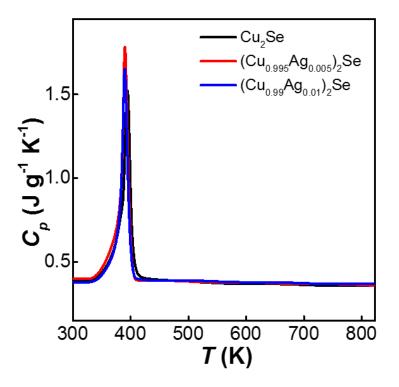


Figure S2. Temperature (*T*)-dependent specific heat ( $C_p$ ) of as-prepared (Cu<sub>1-x</sub>Ag<sub>x</sub>)<sub>2</sub>Se pellets.

## Reference

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