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Achieving thermoelectric improvement through the addition of a small amount of graphene to $CuAlO_2$ synthesized by solid-state reaction

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Abstract

In this work, delafossite $CuAlO_2$ powders with graphene (0.00 to 0.20 wt.%) were synthesized by a solid-state reaction method**.** X-ray diffraction and transmission electron microscope results indicated that graphene was segregated in $CuAlO_2$ as a split phase, such as composite material. A little addition of graphene content reduces the thermal conductivity and increases the carrier concentration because the graphene generates many point defects and aided carrier-phonon scattering. The $CuAlO_2$ with graphene content of 0.05 wt.% shows the maximum electrical conductivity of 470 S/m at 700 K. In addition, the maximum value for *ZT* of 0.0045 was recorded at 575 K with the graphene/$CuAlO_2$ composite (0.05 wt.%). Therefore, in brief, this study has highlighted the benefits of combining delafossite $CuAlO_2$ with a small amount of graphene as a potential route for achieving highly efficient thermoelectric materials.