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Recent advances, challenges, and perspective of copper-based liquid-like thermoelectric chalcogenides: A review

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Abstract

The liquid-like thermoelectric materials have fascinated extensive attention in the field of waste heat recovery into useful energy. In this aspect, di-chalcogenides Cu2X were considered superionic thermoelectric materials due to their highly disordered degree of Cu-ion in the lattice, which realizes the ultralow thermal conductivity. However, their rigid sublattice can decently maintain the electrical performance, and thus make this group distinct from the other state-of-the-art thermoelectric materials. This review summarizes the well-designed strategies to realize the impressive performance in thermoelectric materials and their modules by linking the adopted approaches, with the moderate design of the device. Some recent reports are selected to outline the fundamentals, underlined challenges, outlooks, and future development of Cu2(S, Se, Te) liquid-like thermoelectric materials. We expect that this review will cover the needs of future researchers in choosing some potential materials to further explore thermoelectricity in other energy storage and efficient conversion technologies.

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