Thermoelectric properties of doped Bi_2O_2Se

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Over the past decade, Bi_2O_2Se has emerged as an interesting 2D material. It has excellent carrier mobility and mechanical properties in its single crystal form. Thanks to its remarkable transport properties, Bi_2O_2Se has also been explored in polycrystalline form for thermoelectric applications. Bi_2O_2Se is an n-type thermoelectric material characterized by a quasi-2D layered structure. Numerous studies have shown that this material can achieve low thermal conductivity, and its carrier concentration and mobility can be adjusted through doping. In this study, we have examined the substitution of Bi with transition metals, focusing on manganese as a case study. Our analysis of transition metal-doped Bi_2O_2Se polycrystalline samples included X-ray diffraction, scanning electron microscopy, and measurements of electrical conductivity, Seebeck coefficient and thermal conductivity. We compared the solubility limits, transport properties, and other parameters of our samples with existing literature data, offering explanations for the significant discrepancies observed.

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