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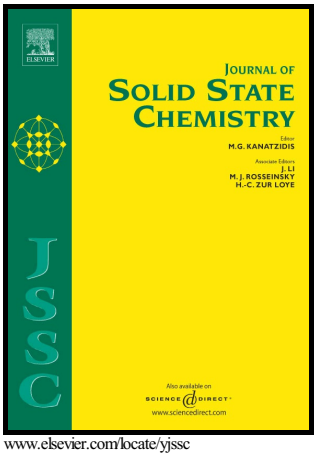

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Attempting to realize n-type BiCuSeO

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Abstract

As an intrinsic p-type semiconductor, BiCuSeO has been widely researched in the thermoelectric community, however, n-type BiCuSeO has not been reported so far. In this work, we successfully realized n-type BiCuSeO through carrying out several successive efforts. Seebeck coefficient of BiCuSeO was increased through introducing extra Bi/Cu to fill the Bi/Cu vacancies that may produce holes, and the maximum Seebeck coefficient was increase from +447 μVK^{-1} for undoped BiCuSeO to +638 μVK^{-1} for $Bi_{1.04}Cu_{1.05}SeO$. The Seebeck coefficient of $Bi_{1.04}Cu_{1.05}SeO$ was changed from p-type to n-type through electron doping through introducing Br/I in Se sites, the maximum negative Seebeck coefficient can reach ~ -465 μVK^{-1} and -543 μVK^{-1} for $Bi_{1.04}Cu_{1.05}Se_{1-x}I_xO$ and $Bi_{1.04}Cu_{1.05}Se_{1-x}Br_xO$, respectively. Then, after compositing $Bi_{1.04}Cu_{1.05}Se_{0.99}Br_{0.01}O$ with Ag, n-type BiCuSeO can be absolutely obtained in the whole temperature range of 300-873 K, the maximum *ZT* ~0.05 was achieved at 475 K in the $Bi_{1.04}Cu_{1.05}Se_{0.99}Br_{0.01}O$+15% Ag. Our report indicates that it is possible to realize n-type conducting behaviors in BiCuSeO system.