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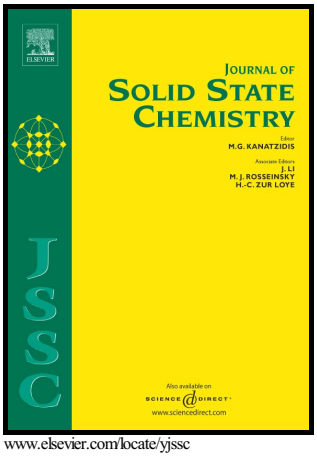

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PII: S0022-4596(18)30226-3
DOI: https://doi.org/10.1016/j.jssc.2018.05.037
Reference: YJSSC20243

To appear in: *Journal of Solid State Chemistry*

Received date: 26 March 2018
Revised date: 21 May 2018
Accepted date: 27 May 2018

Cite this article as: Yun-Qiao Tang, Kexiang Zhang, Zhen-Hua Ge and Jing Feng, Facile Synthesis and Thermoelectric Properties of $Cu_{1.96}S$ compounds, *Journal of Solid State Chemistry,* https://doi.org/10.1016/j.jssc.2018.05.037

Facile Synthesis and Thermoelectric Properties of $Cu_{1.96}S$ compounds

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Abstract:

$Cu_{2-x}S$ compounds with low-cost and low-toxicity elements have been reported as good candidates for thermoelectric (TE) application. In this work, the $Cu_{1.96}S$ powders were synthesised by both hydrothermal synthesis (HS) and mechanical alloying (MA) methods. The HS synthesis process and mechanism was discussed in detail. The polycrystalline $Cu_{1.96}S$ bulk materials were obtained by condensing the powders (prepared by HS and MA) or the mixed HS and MA powers with the different ratio (1:0, 9:1, 1:9 and 0:1) using spark plasma sintering (SPS) technique. The phase structure, microstructure of the powders and bulk samples were checked. The results show that the $Cu_{1.96}S$ powders synthesised by HS are more stable than the powder prepared by MA method during the SPS process. And the thermoelectric properties of all bulk samples were investigated in detail at the temperature ranges from 323 to 773 K. The $Cu_{1.96}S$ bulk sample sintered by using mixed powders of 90 wt% HSed powders and 10 wt% MAed powders obtained the maximum ZT value of 1.01 at 773 K, which is currently the highest reported value for the $Cu_{1.96}S$ system at this temperature.