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Production Techniques for Thermoelectric Higher Manganese Silicide

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As part of the energy crisis and the search for alternative to fossil fuels, the interest in thermoelectric devices for waste heat conversion has grown. For green applications the most well known thermoelectric materials based on IV and group V chalcogenides, have several drawbacks, the main ones being price and toxicity. A group of materials that has recently gained much attention due to their low price and high availability are the metal silicides such as FeSi, MnSi_{1.74}, and Mg₂Si. The metal silicides have shown high ZT values for both *n*-type Mg₂Si ($ZT \sim 1.1$) and *p*-type higher manganese silicides ($ZT \sim 0.7$). In the current research highly efficient thermoelectric higher manganese silicide based materials were developed. The synthesis methods included furnace melting, mechanical alloying and arc melting, all followed by powder metallurgy using spark plasma sintering (SPS). The resulted samples, prepared by all of these three techniques contained some residual MnSi and some residual Si. A comparison between the thermoelectric and the structural properties of the various materials will be described.