Supporting information for

Significant enhancement in thermoelectric performance of nanostructured higher manganese silicide synthesized employing melt spinning technique

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1. Temperature dependence of thermal diffusivity values of the synthesized Al-doped HMS sample, at different wheel speeds.

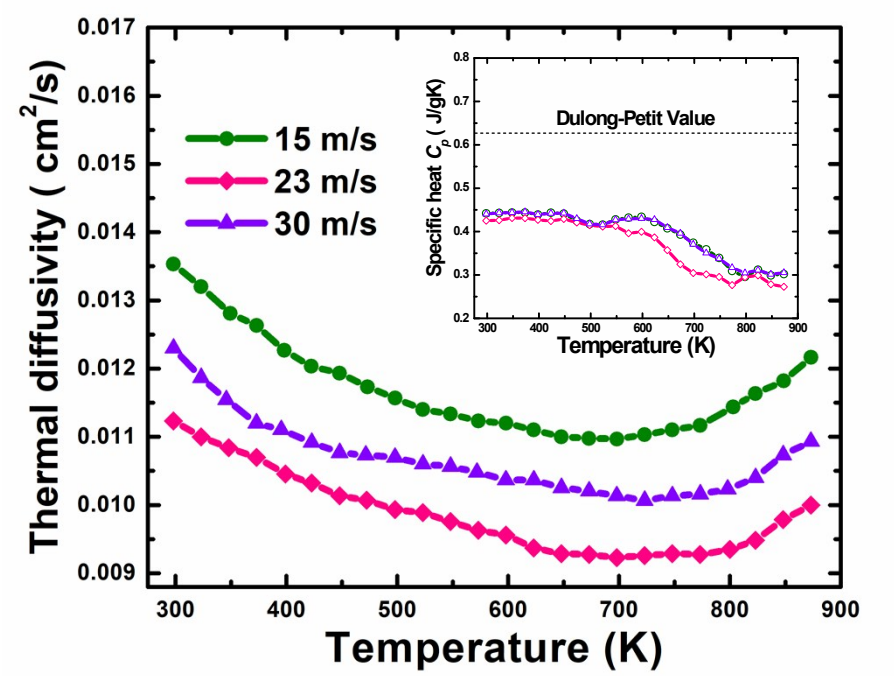

Fig. S1. Temperature dependence of the thermal diffusivity of Al doped HMS samples, synthesized at different wheel speeds. The inset shows the temperature dependence of C_p for the sample melt-spun at a wheel speed of 15 m/s, 23 m/s and 30 m/s

Figure S1 shows the temperature dependence of thermal diffusivity for all the HMS samples synthesized at different wheel speeds (cooling rate) and the inset shows the corresponding temperature dependence of C_p, which suggests that, in general, the C_p decreases with increasing temperature with a high-temperature C_p value, which is far lower than that predicted from the Dulong-Petit law. Similar behaviour has also earlier been reported in several efficient thermoelectric materials, including, $AgCrSe_2$ [S1], Cu_2Se [S2], wherein the C_p values are less than half, as predicted from Dulong-Petit law, have been reported.

However, the situation in our synthesized $MnSi_{1.73}$ HMS samples is rather more complex. The synthesis of single-phase HMS is hindered by the fact that that it is not a eutectic composition and can exist with either an excess of Si or cubic-MnSi (metallic), as is apparent from its phase diagram. This situation is further compounded by the fact that our HMS samples have been synthesized employing melt-spinning using rapid-solidification, which results in the formation of non-equilibrium or metastable phases, owing to a significant amount of undercooling of the melt. Thus, a complex analysis and further calculations are required to quantify the temperature dependence of C_p for our HMS samples, synthesized using melt-spinning.

2. The surface morphology and elemental compositional analysis of the synthesized Al-doped HMS at nanoscale.

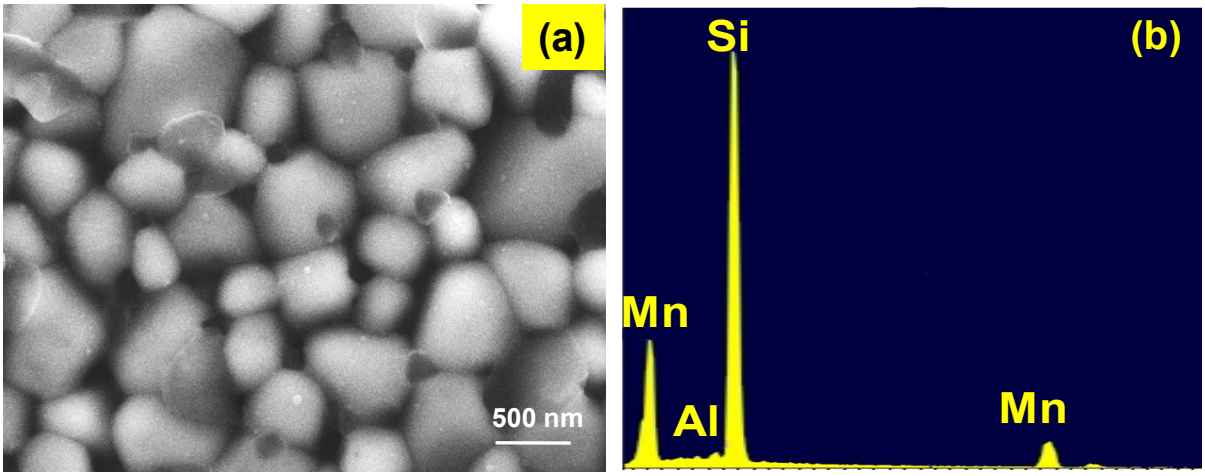

Fig. S2. (a) The surface morphology of Al-doped HMS, at nanoscale, and (b) EDS spectrum

References

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S2. H. Liu, X. Shi, F. Xu, L. Zhang, W. Zhang, L. Chen, Q. Li, C. Uher, T. Day, and G. J. Snyder, Nature Materials, 2012, 11, 422–425.