

Abstract Submitted  
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**Thermoelectric materials with embedded nanoparticles- An effective medium approach**<sup>1</sup> MONA ZEBARJADI, KEIVAN ESFARJANI, Department of ME, MIT, Cambridge, MA, ZHIXI BIAN, ALI SHAKOURI, Department of EE, U of California, Santa Cruz, CA, DARPA COLLABORATION — The effect of adding spherical nano-particles inside a host matrix is investigated using the coherent potential approximation. A parabolic band structure is assumed for the host matrix and it is shown that nano-particles can modify the effective mass by up to 20% when their volume fraction is about 10%. The effective band-structure can be fitted by the standard non-parabolic relation, resulting in the negative non-parabolic coefficients in the case of barrier type nano-particles. Interesting peaks have been observed in the group velocity curve versus energy when the nano-particles are deep wells and their volume fraction is more than few percent. We show that using a high volume fraction ( $\sim 5\%$ ) of relatively small ( $\sim 1\text{nm}$ ) uniform size nano-particles the power factor can be enhanced significantly especially at low temperatures.

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