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Thermoelectric properties of n-type nano bulk Si GAOHUA ZHU, Boston College, HOHYUN LEE, Massachusetts Institute of Technology, XIAOWEI WANG, GIRI JOSHI, YUCHENG LAN, JIAN YANG, DEZHI WANG, Boston College, MILDRED DRESSELHAUS, GANG CHEN, Massachusetts Institute of Technology, ZHIFENG REN, Boston College, DEPARTMENT OF PHYSICS, BOSTON COLLEGE TEAM, DEPARTMENT OF MECHANICAL ENGINEERING, MASSACHUSETTS INSTITUTE OF TECHNOLOGY TEAM, DEPARTMENT OF PHYSICS AND ELECTRICAL ENGINEERING, MASSACHUSETTS INSTITUTE OF TECHNOLOGY TEAM — Nano Si has been noticed as a promising substitute material for SiGe. We have observed a 150 to 350 % increase in ZT values in the heavily doped n-type nano Si over the single crystal Si, which mainly comes from the significantly lower thermal conductivity due to the nano size of grains achieved by mechanical alloying and hot press. The key to get higher ZT value is to optimize the doping concentration to achieve high power factor and avoid grain growth during hot-pressing to achieve nano particle size in the final bulk form. So far our research on nano bulk Si has shown promising ZT values close to 1, comparable to that of the traditional SiGe alloys. Silicon is lighter, more refractory, and has better thermal stability than $Si_{0.8}Ge_{0.2}$, and also it is much cheaper than Ge. Pure Si may have advantage over SiGe alloy in mass application of power generation systems.

Zhifeng Ren
Boston College

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