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High Thermoelectric Performance of Nanostructured Bismuth Antimony Telluride Bulk Alloys.[1] B. POUDEL, Q. HAO, Y. MA, A. MINNICH, A. MUTO, Y.C. LAN, B. YU, X. YAN, D.Z. WANG, D. VASHAEE, X.Y. CHEN, M.S. DRESSELHAUS, G. CHEN, Z.F. REN, GMZ ENERGY, INC. TEAM, DEPARTMENT OF PHYSICS, BOSTON COLLEGE TEAM, DEPARTMENT OF MECHANICAL ENGINEERING, MIT COLLABORATION, DEPARTMENT OF PHYSICS, MIT COLLABORATION — Bismuth Telluride and its alloys are best thermoelectric materials for near room temperature applications like refrigeration and waste heat recovery. We have been pursuing an approach of random nanostructures in bulk to improve ZT of these materials. Here we report that ZT values of these random nanostructured materials were improved significantly over the state-of-the-art values. Experimental data coupled with microstructure studies and modeling shows that the ZT improvement mainly comes from a lower thermal conductivity because of the increased phonon scattering by defects and grain boundaries. Significantly improved power generation and cooling data produced from these samples confirmed the high ZT values.

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