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Nanostructure Formation on Sb_2Te_3 Thin Films Induced by Femtosecond Laser Irradiation[1] YUWEI LI, VLADIMIR. A. STOICA, LYNN ENDICOTT, GUOYU WANG, Dept. of Physics, Univ. of Michigan, HUARUI SUN, KEVIN. P. PIPE, Dept. of Mechanical Engineering, Univ. of Michigan, CTIRAD UHER, ROY CLARKE, Dept. of Physics, Univ. of Michigan — Sb_2Te_3 has applications in thermoelectrics, phase-change memory devices and topological insulators. In the case of thermoelectricity, nanostructure formation in this type of material has been predicted to enhance its figure of merit for thermal energy conversion. Here, we present our results on modification of the surface morphology of Sb_2Te_3 thin films after femtosecond laser irradiation. Under a narrow range of laser fluence and irradiation time, long and highly-aligned nanotracks were formed in the plane of the film, having a periodicity 10 times smaller than the irradiation laser wavelength. The laser fluence and irradiation time can result in different surface nanostructure morphologies with varying degrees of order. Finally, using an optical pump-probe technique, we find that the laser-irradiated nanostructured areas of the film have a lower thermal conductivity compared to that of the reference smooth areas not irradiated by the laser. Such Sb_2Te_3 nanostructures can be important for thermoelectric applications as well as for further studies of femtosecond laser interaction with opaque materials.

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