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Laser induced oxidation and optical properties of bismuth telluride nanoplates[1] ZHIPENG YE, Univ of Northern Iowa, SUKRIT SUCHARITAKUL, Case Western Reserve Univ, COURTNEY KEISER, TIM E. KIDD, Univ of Northern Iowa, XUAN P. A. GAO, Case Western Reserve Univ, RUI HE, Univ of Northern Iowa — Bi-Te nanoplates (NPs) grown by low pressure vapor transport method were studied by Raman spectroscopy, atomic force microscopy (AFM), energy-dispersive X-ray spectroscopy (EDS), and Auger electron spectroscopy (AES). We find that the surface of relatively thick (more than tens of nanometers) Bi2Te3 NPs is oxidized in the air and forms a bump under heating with moderate laser power, as revealed by the emergence of Raman lines characteristic of Bi2O3 and TeO2 and characterization by AFM and EDS. Further increase of laser power burns holes on the surface of the NPs. Thin (thicknesses less than 20 nm) NPs with stoichiometry different from Bi2Te3 were also studied. Raman lines from non-stoichiometric NPs are different from those of stoichiometric ones. Thin NPs with the same thickness but different stoichiometries show different color contrast compared to the substrate in the optical image. This indicates that the optical absorption coefficient in thin Bi-Te NPs strongly depends on their stoichiometry. Controlling the stoichiometry in the Bi-Te NP growth is thus very important for their thermoelectric, electronic, and optical device applications.

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