Physical Vapor Deposition Growth of Topological Insulator Nanostructures\textsuperscript{1} LOREN ALEGRIA, ANASUA CHATTERJEE, ZHONG ZHANG, MICHAEL PRETKO, JAMES TING, SHIVANG PATEL, JASON PETTA, Princeton University — Nanostructures consisting of strong topological insulators are of interest for the fabrication of devices in which surface state transport is dominant. We report Bi$_2$Se$_3$ nanoribbon and nanoplatelet growth using a multi-zone furnace.\textsuperscript{2} Nanoribbons are grown by the vapor-liquid-solid method, using Au nanoparticles or Au thin films (~5 nm) as catalysts, while nanoplatelets are grown on bare silicon. We systematically vary the growth parameters, including the temperatures of the powdered Bi$_2$Se$_3$ precursor and growth substrate, the growth pressure and duration, the rate of the Argon carrier gas flow, size of the gold catalyst, and the quantity of Bi$_2$Se$_3$ source material. Typical nanoribbon growth occurs at 450\degree C and 350 Torr, with the precursor held at 530\degree C in an Argon carrier gas flow rate rate of 140 sccm. Typical platelet growth occurs at lower pressures and temperatures. High resolution transmission electron microscopy, diffraction, and energy dispersive x-ray analysis are used to characterize the synthesized structures.

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