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Microstructural and magneto-transport characterization of $Bi_2Se_xTe_{3-x}$ topological insulator thin films grown by pulsed laser deposition method[1] ZHENGHE JIN, RAJ KUMAR, FRANK HUNTE, JAY NARAYAN, KI WOOK KIM, North Carolina State Univ, NORTH CAROLINA STATE UNIVERSITY TEAM — $Bi_2Se_xTe_{3-x}$ topological insulator thin films were grown on Al_2O_3 (0001) substrate by pulsed laser deposition (PLD). XRD and other structural characterization measurements confirm the growth of the textured $Bi_2Se_xTe_{3-x}$ thin films on Al_2O_3 substrate. The magneto-transport properties of thick and thin lms were investigated to study the effect of thickness on the topological insulator properties of the $Bi_2Se_xTe_{3-x}$ films. A pronounced semiconducting behavior with a highly insulating ground state was observed in the resistivity vs. temperature data. The presence of the weak anti-localization (WAL) effect with a sharp cusp in the magnetoresistance measurements confirms the 2-D surface transport originating from the TSS in $Bi_2Se_xTe_{3-x}$ TI films. A high fraction of surface transport is observed in the $Bi_2Se_xTe_{3-x}$ TI thin films which decreases in $Bi_2Se_xTe_{3-x}$ TI thick films. The Cosine (θ) dependence of the WAL effect supports the observation of a high proportion of 2-D surface state contribution to overall transport properties of the $Bi_2Se_xTe_{3-x}$ TI thin films. Our results show promise that high quality $Bi_2Se_xTe_{3-x}$ TI thin films with significant surface transport can be grown by PLD method to exploit the exotic properties of the surface transport in future generation spintronic devices.

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