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Electrical and Optical Characteristics of Undoped and Se-Doped Bi_2S_3 Transistors[1] COLIN KILCOYNE, ALI ALSAQQA, Department of Physics, State Univ of NY - Buffalo, AJARA A. RAHMAN, LUISA WHITTAKER-BROOKS, Department of Chemistry, University of Utah, G. SAMBANDAMURTHY, Department of Physics, State Univ of NY - Buffalo — Semiconducting chalcogenides have been drawing increased attention due to their interesting physical properties, especially in low dimensional structures. Bi_2S_3 has demonstrated a high optical absorption coefficient, a large bulk mobility, small bandgap, high Seebeck coefficient, and low thermal conductivity. These properties make it a good candidate for optical, electric and thermoelectric applications. However, control over the electrical properties for enhanced thermoelectric performance and optical applications is desired. We present electrical transport and optical properties from individual nanowire and few-layer transistors of single crystalline undoped and Se-doped $Bi_2S_{3-x}Se_x$. All devices exhibit n-type semiconducting behavior and the ON/OFF ratio, mobility, and conductivity noise behavior are studied as functions of dopant concentration, temperature, and charge carrier density in different conduction regimes. The roles of dopant driven scattering mechanisms and mobility/carrier density fluctuations will be discussed. The potential for this series of materials as optical and electrical switches will be presented.

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