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Doping control and spatially resolved optoelectronics of Bi2Se3 nanowires and nanoribbons XINGYUE PENG, YIMING YANG, DONG YU, Univ of California - Davis, PROF. NICHOLAS CURRO COLLABORATION, PROF. FRANCOIS LEONARD COLLABORATION — Bi2Se3 has been predicted to be a 3D topological insulator with chiral surface states protected by time-reversal symmetry. Single crystalline Bi2Se3 nanowires and nanoribbons were synthesized via a vapor-liquid-solid approach. Carrier concentrations can be tuned in a wide range by varying Se vapor pressure during the growth. High carrier mobilities up to 200 cm^2/Vs at room temperature and 1000 cm^2/Vs at 2 K were achieved. A surface conduction channel was identified from the temperature dependent transport measurement. Magnetoresistance measurement showed a signature weak anti-localization peak of the chiral surface states. Scanning photocurrent microscopy (SPCM) study of these nanoribbons showed an alternating photocurrent polarity with a length scale of 1 um, which indicates a potential variation on the surface of these nanoribbons, despite the high crystallinity confirmed by transmission electron microscope. Kelvin probe microscopy was used to characterize such surface potential variation of these nanowires and nanoribbons. We will discuss the possible origin of this surface potential variation.

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