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Scanning tunneling microscopy study of ultrathin topological insulator Bi_2Te_3 nanoribbons CAROLINA PARRA, DESHENG KONG, JASON C. RANDEL, ALEX W. CONTRYMAN, FRANCIS NIESTEMSKI, MING RUE D. THIAN, YI CUI, HARI C. MANOHARAN, Stanford University — Currently there is an increasing interest in the study of topological insulators (TI) nanostructures as a result of their large surface-to-volume ratio, which allows the manifestation of surface conduction states without masking by bulk carriers. We performed low-temperature scanning tunneling microscopy (STM) measurements of the surface of TI Bi_2Te_3 nanostructures grown on HOPG. Although surface states of TIs are inherently robust against almost any surface modifications, these materials are prone to various surface chemical reactions which are taken into account when preparing samples for devices and STM study. Our STM measurements reveal the presence of ultrathin nanostructures (nanoribbons and nanoplates) which show an important growth anisotropy, with lateral dimension growing much faster than the vertical thickness dimension. Nanoribbons group mainly in bunches, with an aspect ratio of 1:300 and thickness down to 6 nm (6 quintuple layers). Nanoplates with hexagonal morphology of lower than 20 quintuple layers thick were also found, suggesting both one- and two-dimensional preferential growth.

Carolina Parra
Stanford University

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