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Spatial Progression of Thermal Oxidation in Layered WSe2 Nano-sheets YINGNAN LIU, Department of Physics, University of Texas at Austin , CHENG TAN, Microelectronics Research Center, University of Texas at Austin, HARRY CHOU, Department of Mechanical Engineering, University of Texas at Austin , AVINASH NAYAK, Microelectronics Research Center, University of Texas at Austin, DI WU, Department of Physics, University of Texas at Austin, JOONSEOK KIM, Microelectronics Research Center, University of Texas at Austin, RODNEY RUOFF, Department of Mechanical Engineering, University of Texas at Austin, DEJI AKINWANDE, Microelectronics Research Center, University of Texas at Austin, KEJI LAI, Department of Physics, University of Texas at Austin — Owing to the extremely different bonding strengths between intralayer covalent bonds and interlayer van der Waals interaction, many physical and chemical properties of layered transition metal dichalcogenides are expected to be highly anisotropic in nature. Using a number of compositional, structural, and electrical characterization tools, we have studied the spatial progression of the thermal oxidation of exfoliated WSe2 nano-sheets, which primarily starts at the sample edges and propagates laterally towards the center. As revealed by microwave impedance microscopy and transport measurements, the partially oxidized regions show much higher conductivity than either the WSe2 itself or the completely oxidized WO3. The ability to electrically map out how chemical reactions are taking place in the nanoscale could be of particular importance for 2D materials that hold promise for future applications.

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