Development of a nanolithography package for local AFM oxidation

ANDREW T. MCNAMARA, HONG CHEN, J.J. HEREMANS, V. SOGHOMONIAN, Ohio University, Department of Physics and Astronomy — We describe the process of nanolithography by local oxidation using an atomic force microscope tip, on GaAs and on InAs/AlGaSb heterostructures. The commercial microscope’s tip is controlled by a home-written software package, that includes a variety of graphics primitives of use in nano-electronic geometries, allowing the user to design appropriate patterns, and control lithographic parameters. The microscope’s contact tip is held grounded while the sample is held at a positive voltage, causing a local current and oxidation of the sample under the tip. The oxidized region on the semiconductor is nonconducting, or can be etched away, to form the required device structure. We characterize the process and obtainable line widths on substrate material and heterostructures, and explore the suitability of our method to create transport based nanoscale devices (partially supported by NSF REU and NSF DMR-0103034).