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Direct Writing of Graphene-based Nanoelectronics via Atomic Force Microscopy MICHAEL HAYDELL, ELENA CIMPOIASU, US Naval Academy, Physics Dept., Annapolis, MD, 21402, WOO KYUNG LEE, RORY STINE, Naval Research Laboratory, Surface Nanoscience and Sensor Technology, Washington DC, 20375, WILLIAM P. KING, Univ. of Illinois at Urbana-Champaign, Dept. of Mech. Science and Eng., Urbana, IL, 61801, PAUL SHEEHAN, Naval Research Laboratory, Surface Nanoscience and Sensor Technology, Washington DC, 20375 — We use direct writing with an atomic force microscope (AFM) to fabricate simple, graphene-based electronic components to explore their electronic properties and the feasibility of manufacturing electronic devices via AFM. The process being studied, thermochemical nanolithography (TCNL), involves flowing current through an AFM cantilever to provide thermal energy to a chemically modified graphene (CMG) film, either graphene oxide or graphene fluoride. The heat reduces the insulating CMG film back into conductive graphene. Thus, these nanoribbons can be used to fabricate nano-scale electronic components such as resistors, capacitors, and transistors. The technique, as compared to other attempts to produce graphene-based devices, is simple, does not involve solvents or other complicated fabrication steps, and allows for the exact placement of the devices on the substrate. The electronic properties of the devices produced using the two materials, measured using current-voltage characteristics at various temperatures down to 2 K and in variable magnetic fields up to 9 T, will be discussed. This work was partially supported by the US Naval Academy Research Office and the Nanoscience Institute at NRL.

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