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Sub-lithographic Patterning of Extended Arrays of Graphene Nanostructures KE LI, 1, WEI HAN, 2, SARAH C. PARKS, 1, WENZHONG BAO, JOHN CIRALDO, CHUN NING LAU, ROLAND KAWAKAMI, 2, EZEKIEL JOHNSTON-HALPERIN, 1 (1 Department of Physics, The Ohio State University; 2 Department of Physics and Astronomy, University of California, Riverside) — Quasi-one-dimensional graphene nanoribbons (GNRs) with narrow width (w $\leq$ 10 nm) and smooth edges have been shown to exhibit bandgaps due to quantum confinement and edge effects. Current fabrication methods of GNRs include electron beam lithography and chemical synthesis. However, the lithographic approach has difficulties in reaching true nanometer-scale widths while the chemical approach lacks fidelity in GNR length and width control. The recent development of sub-lithographic patterning using the superlattice nanowire pattern transfer (SNAP) technique provides a novel approach to fabricating ultra-long ($>$ 1 mm) GNRs with width down to 7 nm. In addition, repeating SNAP at 90° with respect to the 1st patterning potentially allows graphene rectangular antidot arrays with N_{dot}=160,000 and dot density up to 10^{11} /cm^2 (dot-to-dot spacing 15 nm; dot area 8 nm $\times$ 8 nm). This novel sub-lithographic patterning technique should enable tailored graphene nanostructures and high throughput manufacturing of GNR-based nano-devices for next generation nanoelectronic applications.

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