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**Patterning Effects on electronic Properties of Hydrogenated Graphene Superlattices** M. YANG, Y. P. FENG, T. VENKATESAN, A. ARIANDO, C. ZHANG, NanoCore, National University of Singapore — Recently, it was found that the absorption of hydrogen atoms on graphene can modify the electronic properties greatly. This finding not only opens another possibility for tuning the electronic properties of graphene, but also allows us to pattern hydrogenated graphene to obtain the desired electronic properties. Here, we report results of density-functional based tight-binding calculations of patterning effects such as pattern edge, pattern shape (triangular and hexagonal shape) and type (zigzag and armchair), and lattice pattern (triangle and square) and size on electronic properties of hydrogenated graphene superlattices. It is found that electronic properties of hydrogenated graphene superlattices are sensitive to the pattern edge. Superlattices with zigzag edge, have very small bandgaps or are metallic. Superlattices with armchair edge, exhibit much larger bandgaps whose magnitude is dependant on the pattern shape, lattice, and pattern size. In addition, electronic properties of a quantum dot, formed by removing a lattice from the two-dimensional hydrogenated graphene superlattices, will also be discussed.

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