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Symmetries and band gaps in nanoribbons[1] ZHIWEI ZHANG, YITENG TIAN, GAYANATH FERNANDO, University of Connecticut, Storrs, CT, ARMEN KOCHARIAN, California State University, Los Angeles, CA — In ideal graphene-like systems, time reversal and sublattice symmetries preserve the degeneracies at the Dirac point(s). We have examined such degeneracies in the band structure as well as the transport properties in various arm-twisted (graphene-related) nanoribbons. A twist angle is defined such that at 0 degrees the ribbon is a rectangular ribbon and at 60 degrees the ribbon is cut from a honeycomb lattice. Using model Hamiltonians and first principles calculations in these nanoribbons with Z_2 topology, we have monitored the band structure as a function of the twist angle θ. In twisted ribbons, it turns out that the introduction of an extra hopping term leads to a gap opening. We have also calculated the size and temperature broadening effects in similar ribbons in addition to Rashba-induced transport properties.

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