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Carbon Tetragons as Definitive Spin Switches in Narrow Zigzag Graphene Nanoribbons[1] ZHENYU ZHANG, PING CUI, QIANG ZHANG, HONGBIN ZHU, XIAOXIA LI, WEIYI WANG, QUNXIANG LI, CHANGGAN ZENG, University of Science and Technology of China — Precise spatial control of the spin propagation channels is of fundamental and practical importance in future graphene-based spintronic devices. Here we use first-principles calculations to show that when narrow zigzag graphene nanoribbons are connected to form junctions or superlattices, properly placed square-shaped carbon tetragons not only serve as effective bundles of the two incoming spin edge channels, but also act as definitive topological spin switches for the two outgoing channels. The nanoribbon segments are largely drawn from different acene molecules. We further show that such spin switches can lift the degeneracy between the two spin propagation channels, which enables tunability of different magnetic states upon charge doping. Preliminary experimental supports for the realization of such tetragons connecting nanoribbon segments are also presented.

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