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Strain-Engineering the Gauge Potential of Dirac fermions in PECVD-grown Graphene CHEN-CHIH HSU, MARCUS TEAGUE, JAIQING WANG, NAI-CHANG YEH, Dept. of Physics, Caltech — Non-trivial strain can induce pseudo-magnetic fields in graphene so that the electronic properties of Dirac fermions can be tuned by controlling the strain on graphene. Here we employ nearly strain-free single-domain PECVD-graphene[1] to induce controlled strain by placing graphene on nanostructured substrates. Strain-induced gauge potentials and pseudo-magnetic fields can be manifested by the local tunneling conductance peaks at quantized energies.[2,3] Additionally, pseudo-magnetic field-induced local spontaneous time-reversal symmetry breaking can be revealed by spatially alternating presence and absence of the zero mode in the tunneling conductance spectra.[2,3] We also employ molecular dynamics simulations to determine the spatial distribution of the pseudo-magnetic field for a given nanostructure. We find that a tetrahedron-like nanostructure can be an effective valley splitter to separate the trajectories of Dirac fermions of opposite pseudo-spins. Proper design and arrangement of several valley filters can function as a valley propagator to guide valley-polarized currents. We plan to verify the valley Hall effect associated with a valley splitter and to assess the feasibility of realistic valleytronic applications. 1. D.A. Boyd et al. Nat. Comm. 6, 6620 (2015). 2. N.-C. Yeh et al. Surface Science 605, 1649-1656 (2011). 3. N.-C. Yeh et al. Acta Mechanica Sinica (in press).

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