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Anisotropic Dirac Fermions in Novel 2D Carbon and Silicon Allotropes ZHENHAI WANG, Stony Brook University, MINGWEN ZHAO, Shandong University, XIANG-FENG ZHOU, QIANG ZHU, Stony Brook University, XIAOMING ZHANG, Shandong University, HUAFENG DONG, ARTEM R. OGANOV, Stony Brook University, SHUMIN HE, PETER GRÜNBERG, Nanjing University of Posts and Telecommunications — Graphene, due to its unique Dirac cones with linear dispersion, exhibits a number of novel physics, such as high carrier mobility and quantum hall effect. Successful preparation of graphene in 2004 has inspired further searches for other 2D Dirac materials. Using systematic evolutionary structure searching, here we proposed one interesting type of 2D Dirac allotropes, which were named as 'phagraphene' [Nano. Lett. 15, 6182 (2015)] and 'siliconeet' respectively. Compared with the isotropic energy dispersion in graphene, the Dirac cones in these samples are direction-dependent. Further investigations proved that such anisotropic behaviors and the distorted Dirac cones are robust against external strain with tunable Fermi velocities. These predictions pave a new way to construct novel functional Dirac materials that might have potential applications in future.

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