The anisotropy of Dirac cones in rectangular lattices MINGSU SI,
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diana State University — Thanks to the perfect hexagonal lattice, graphene holds
the isotropic Dirac cone. This means the group velocities of charge carriers in the
vicinity of Dirac point are isotropic in the momentum space. When the lattice struc-
ture varies, Dirac cone will undergo a dramatic change accordingly. This is the case
of 6,6,12-graphyne. Due to the rectangular lattice, Dirac cones of 6,6,12-graphyne
are anisotropic. To understand its underlying nature, three two-dimensional carbon
allotropes with the rectangular lattice are studied using the first-principles method.
Although the existence of Dirac cone critically depends on the hopping parameters
within the unit cell, the anisotropy of Dirac cone is another story. This is because
the anisotropy of Dirac cone describes the relation between carrier's velocities, and
thus is momentum-dependent. It is demonstrated that the anisotropy of Dirac cone
can be regarded as an information carrier. This will be the focus of future research.

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