Control of superconducting pairing symmetries in monolayer black phosphorus - DTU Orbit
(25/04/2019)

Control of superconducting pairing symmetries in monolayer black phosphorus
Motivated by recent experimental progress, we study the effect of mechanical deformations on the superconducting
pairing symmetries in monolayer black phosphorus (MBP). Starting with phonon-mediated intervalley spin-singlet electron-
electron pairing and making use of realistic band parameters obtained through first-principles calculations, we show that
the application of weak mechanical strain in the plane of MBP can change the effective s-wave and p-wave symmetry of
the superconducting correlations into effective d-wave and f-wave symmetries, respectively. This prediction of a change in
the pairing symmetries might be experimentally confirmed through angular dependence high-resolution tunneling
spectroscopy, the Meissner effect, and critical temperature experiments. The idea of manipulating the superconducting
symmetry class by applying planar mechanical strain can be extended to other anisotropic materials as well and may help
in providing important information of the symmetries of the order parameter, perhaps even in some high-Tc
superconductors.

General information
Publication status: Published
Organisations: Department of Photonics Engineering, Department of Physics, Center for Nanostructured Graphene, K.N.
Toosi University of Technology
Contributors: Alidoust, M., Willatzen, M., Jauho, A. P.
Number of pages: 10
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: Physical Review B
Volume: 99
Issue number: 12
Article number: 125417
ISSN (Print): 2469-9950
Ratings:
BFI (2019): BFI-level 1
Web of Science (2019): Indexed yes
Original language: English
Electronic versions:
DOIs:
10.1103/PhysRevB.99.125417
Source: Scopus
Source-ID: 85063269885
Research output: Contribution to journal › Journal article – Annual report year: 2019 › Research › peer-review