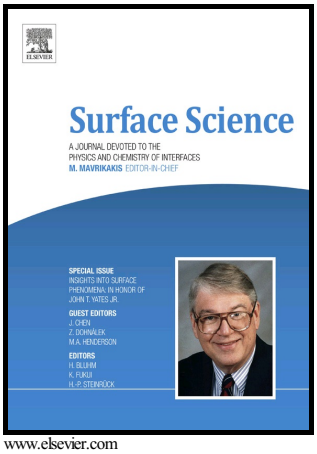
Spin-orbit band gaps and destruction of Dirac cones

I.N. Yakovkin



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PII: S0039-6028(16)30602-1
DOI: http://dx.doi.org/10.1016/j.susc.2017.02.015
Reference: SUSC21005

To appear in: *Surface Science*

Cite this article as: I.N. Yakovkin, Spin-orbit band gaps and destruction of Dirac cones, *Surface Science,* http://dx.doi.org/10.1016/j.susc.2017.02.015

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I. N. Yakovkin

Institute of Physics of National Academy of Sciences of Ukraine, Prospect Nauki 46, Kiev 03028, Ukraine.

email: yakov@iop.kiev.ua

The relativistic band structures of the IV group honeycomb monolayers, from graphene to plumbene (C-Si-Ge-Sn-Pb), have been calculated within DFT in Local Density Approximation (LDA). Basing on the obtained results, we suggest that the spin-orbit coupling leads to opening of the band gaps and therefore will unavoidably cause the destruction of the perfect shape of Dirac cones which is responsible for the existence of the massless Fermions. The applicability of ordinary non-relativistic DFT calculations of bands for graphene-like layered structures is discussed in this regard.

Graphical abstract