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Curvature-induced p-n junction and spin-orbit interaction effects in bilayer graphene YOGESH JOGLEKAR, Indiana University -Purdue University Indianapolis (IUPUI), AVADH SAXENA, Los Alamos National Laboratory (LANL) — A non-relativistic quantum particle on a two-dimensional curved surface experiences a surface-geometry induced attractive potential and an additional spin-orbit interaction that are both characterized by the principle curvatures (κ_1, κ_2) at a given point. With bilayer graphene sheets in mind, we obtain the geometric potential $V_G(\kappa_1, \kappa_2)$ and corrections to the spin-orbit interaction $H_{so}(\kappa_1, \kappa_2)$ for several surface shapes. The geometric potential suppresses the local Fermi energy. By estimating the value for this potential, we show that in zero-gap materials surface-curvature will provide a novel avenue to create p-n junctions and, in general, to control local electronic properties. A similar analysis is carried out for surface-curvature correction to the spin-orbit coupling and its consequences.

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