Valley focusing in a corrugated graphene

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Graphene corrugations affect hybridization of π and σ orbitals of carbon atoms in graphene based systems. It can as well break differently the symmetry of the electron transfer integrals for different strip boundaries. Using these facts, we found that the momentum distribution of electrons in ballistically propagating beam can be selective without external electric and/or magnetic fields in the graphene strip under experimentally feasible periodic potential [**?**]. Such a potential is created by means of the superlattice that consists of periodically repeated graphene elements (flat+rippled junction) with different hybridization of carbon orbits, produced by variation of the graphene surface curvature. As a result it gives rise to the valley dependent focusing effects that can be controlled by alteration of number N of superlattice elements.

This effect becomes essential for incident electrons, moving in the energy interval $0 < E < \varepsilon$, where ε is the energy difference between of π orbitals in the curved and flat graphene sheet. At $N \gg 1$, only for the direction perpendicular to the surface of the superlattice with zig-zag edge termination there is almost the ideal transmission, while for the other angles there is the strong reflection. In the superlattice with armchair edge termination similar filtering takes place at the supercollimation angle $|\varphi| \approx 25.5^{\circ}$.

References

[1] M. Pudlak, R. Nazmitdinov, *Valley focusing effect in a rippled graphene superlattice*, Phys. Rev. B, **109**, 205402 (2024).