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Electronic transport close to semi-infinite 2D systems and their interfaces[1] FANBING XIA, JIAN WANG, The University of Hong Kong, JIAN WANG'S RESEARCH GROUP TEAM — Transport properties of 2D materials especially close to their boundary has received much attention after the successful fabrication of Graphene. While most previous work is devoted to the conventional lead-device-lead setup with a finite size center area, this project investigates real space transport properties of infinite and semi-infinite 2D systems under the framework of Non-equilibrium Green's function. The commonly used method of calculating Green's function by inverting matrices in the real space can be unstable in dealing with large systems as sometimes it gives non-converging result. By transforming from the real space to momentum space, the author managed to replace the matrix inverting process by Brillouin Zone integral which can be greatly simplified by the application of contour integral. Combining this methodology with Dyson equations, we are able to calculate transport properties of semi-infinite graphene close to its zigzag boundary and its combination with other material including s-wave superconductor. Interference pattern of transmitted and reflected electrons, Graphene lensing effects and difference between Specular Andreev reflection and normal Andreev reflection are verified. We also generalize how to apply this method to a broad range of 2D materials.

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