Supplementary Material

Chart, line chart

Description automatically generated

**Figure S1.** Band structure of optimized silicene at the K-point and around the Fermi level, featuring the and energy bands, and considering LDA (black) and GGA (red) calculations.

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**Figure S2.** (a) DFT Band structure of graphene at the K-point and around the Fermi level, featuring the and energy bands in green and black respectively. The cyan line indicates a linear fit. (b) A color plot depicting the charge-carrier velocity (106 m/s) of graphene in the vicinity of the K-point. The plot shows how the velocity changes with energy and wavevector. The negative value of charge-carrier velocity refers to the velocity in the valence band.

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**Figure S3.** (a) GW Band structure of graphene at the K-point and around the Fermi level, featuring the and energy bands in green and black respectively. The cyan line indicates a linear fit. (b) A color plot depicting the charge-carrier velocity (106 m/s) of graphene in the vicinity of the K-point. The plot shows how the velocity changes with energy and wavevector. The negative value of charge-carrier velocity refers to the velocity in the valence band.