Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C

Supporting Information

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The optimized lattice constant ($\sqrt{3}$ times of bond length) of monolayer 2d-SiC is 3.10 Å (1.79 Å bond length as shown in Figure S1), in agreement with previous theory and experiments.[17,21,22,27,28] The lattice constant of graphene and silicene are 2.46 and 3.87 Å,[15] respectively. The thicknesses of graphene, silicene, and monolayer 2d-SiC are 3.35, 3.7, and 3.47 Å from experiments,[13,22,S1] respectively, which are used for the calculation of normal-incidence absorption based on Fresnel theory. For the completeness of research in Figure 1, more optical properties of monolayer 2d-SiC, graphene, and silicene are also shown in Figure S2, where the difference in these three 2d materials can be clearly seen. For the completeness of research in Figure 2 and Figure 4, the real part of permittivity can be tuned by applying in-plane strain in monolayer 2d-SiC or by varying the interlayer distance in bilayer 2d-SiC as shown in Figure S3. Hence tunable plasmonics might be designed based on 2d-SiC.

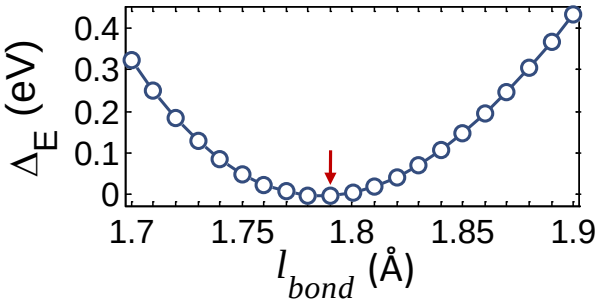

Figure S1: The relative energy Δ_E of monolayer 2d-SiC as a function of bond length l_{bond}. The optimized bond length is 1.79 Å, denoted by the red arrow.

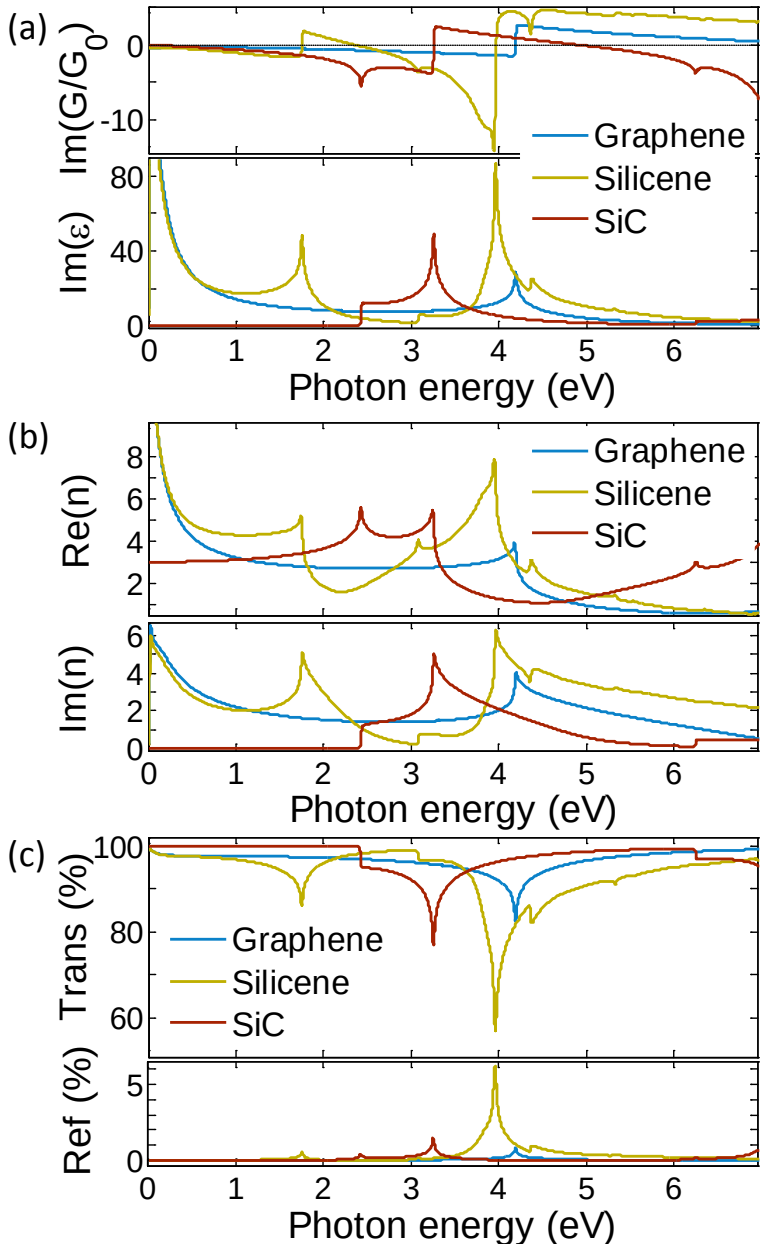

Figure S2: Different optical properties in monolayer 2d-SiC, graphene, and silicene. (a) Optical conductivity and relative permittivity (imaginary part, Im(G) and Im(ε)). (b) Complex refractive index. (c) Normal-incidence reflection and transmission. Reflection of these three 2d materials is small (<1% below 3.0 eV) and can be neglected in a wide energy range.

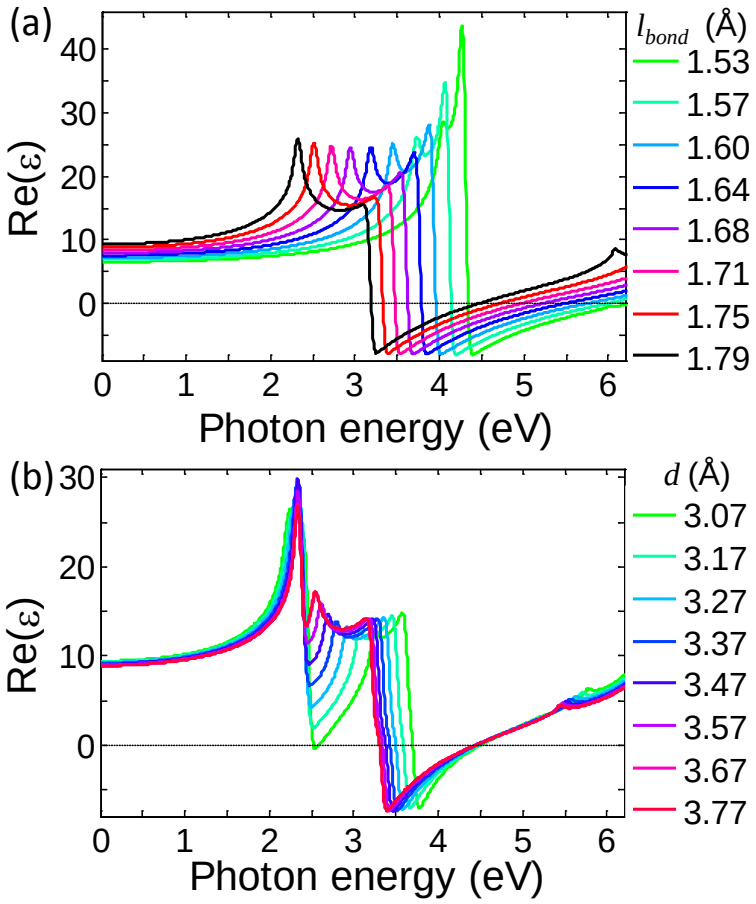

Figure S3: (a) Real part of relative permittivity Re(ε) in monolayer 2d-SiC is sensitive to the bond length l_{bond}. The frequency range of negative Re(ε) red-shifts when elongating l_{bond} and negative Re(ε) can exist below 3.0 eV with l_{bond} > 1.79 Å. (b) Re(ε) in bilayer 2d-SiC can be tuned by varying interlayer distance *d*. The near-ultraviolet negative Re(ε) range blue-shifts when decreasing *d*. Moreover, one more visible negative Re(ε) range could emerge around 2.5 eV when *d* is less than 3.07 Å. Comparing the negative permittivity ranges (in Figure 1(b)) of 4.2-6.0 eV for graphene, 1.8-2.3 eV and 4.0-6.0 eV for silicene, we might obtain negative permittivity at the range of 2.3-4.0 eV in layered 2d-SiC by changing the bond length and the interlayer distance. Thus, one can obtain negative permittivity in most of the range from 1.8 to 6.0 eV by choosing one of these three materials or stacking these three materials together.

Supporting References

[S1]Hanfland M, Beister H and Syassen K, *Phys. Rev. B*, 1989, **39**, 12598.