the separation between Au nanoparticles and graphene increases from 0 to 15 nm, the resonance wavelength has a blue-shift of approximately 29 nm. A further increment of the distance between these two parties causes a red-shift of the resonance, and the shifting saturates when the distance is more than 20 nm. The complex shifting behavior of the resonance wavelength can be understood by the electromagnetic coupling between graphene and particles, the relative permittivity of the surrounding media, and the polarizability of the spacer layer. Our study facilitates a comprehensive experimental study of the electromagnetic coupling of LSPR excited in Au nanoparticles and graphene. In addition, our finding suggests a straightforward and effective way of achieving multicolor selection in graphene/nanoparticles optoelectronic devices.

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