Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.


# Supporting information

# Interband $\pi$ plasmon of graphene: strong small-size and field-enhancement effects

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As far as the refractive index is concerned, we have compared the in plane refractive index of

monolayer graphene obtained by Nelson *et al.*[1] with that of graphite edited by Palik[2], and found that the values in the two references are very close to each other (see Figure S1)

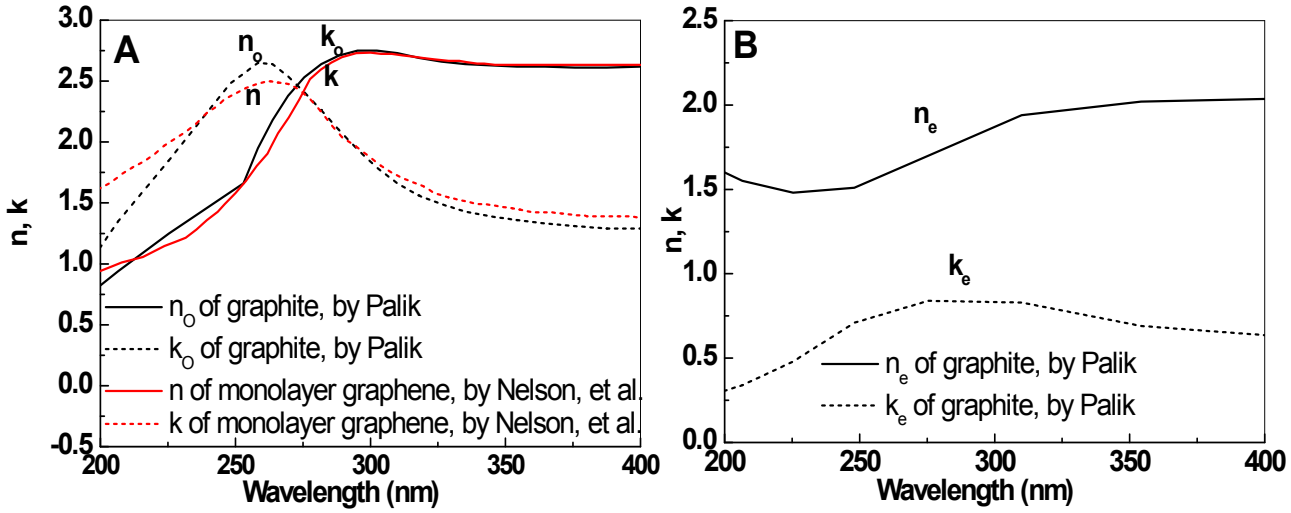
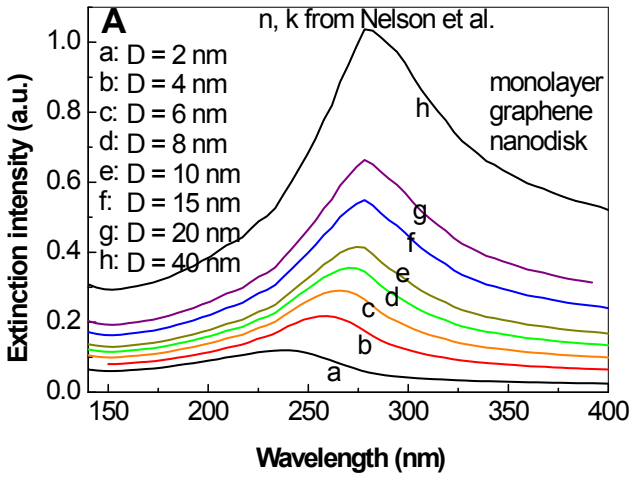
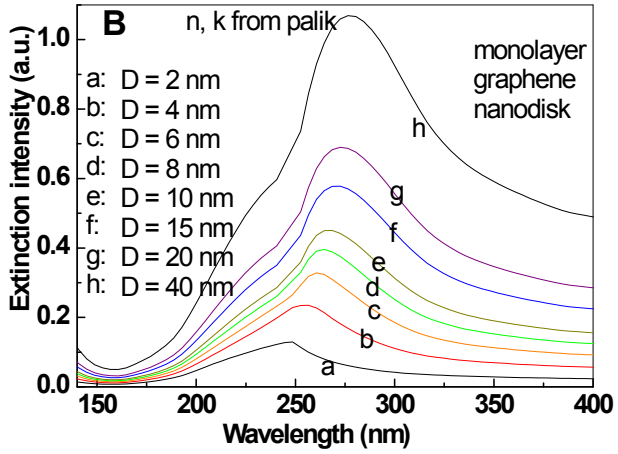



**Figure S1.** (A) Comparison of n and k values (in plane) between monolayer graphene obtained by Nelson *et al.* [1]and graphite edited by Palik,[2] (B) n and k values (out of plane) of graphite edited by Palik.

Further, we have calculated the optical extinction spectra of monolayer graphene with increasing diameter using n and k values of monolayer graphene obtained by Nelson et *al.*[1]and graphite edited by Palik et *al.*,[2] and the result is shown in Figure S2. It can be seen that, although the extinction peak position values, which are calculated respectively using the refractive index of monolayer graphene and graphite, are slightly different, but the change trend of the plasmon with increasing size is almost consistent in the two cases. Thus we choose the refractive index of graphite edited by Palik [2] since the anisotropy of refractive index has been included in this reference, and it is expected that we can obtain the change trend of the interband plasmon with increasing size when mainly considering size effect.



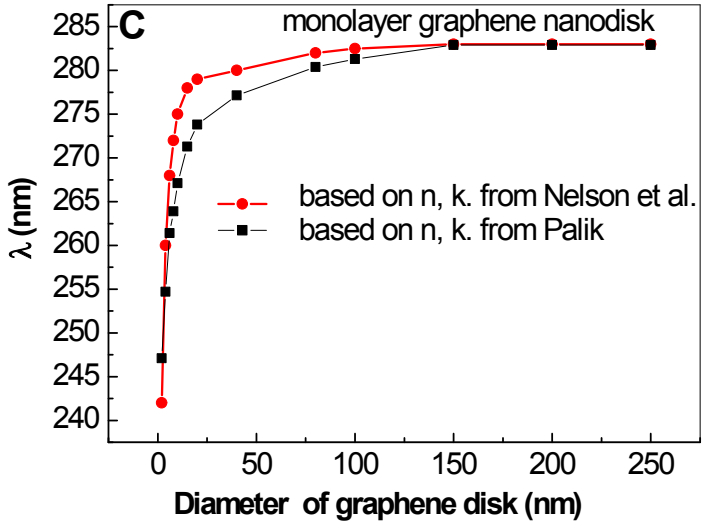




**Figure S2.** Variation of the extinction efficiency $Q_{ext}$ of monolayer graphene nanodisk with diameters from 2 to 40 nm based on the n, k obtained by (A) obtained by Nelson *et al.* [1]and (B) graphite edited by Palik *et al.*[2], (C) the comparison of the wavelength of the extinction peaks for monolayer graphene nanodisk as

a function of the diameter between the two cases.

## References


1 F. J. Nelson, V. K. Kamineni, T. Zhang, E. S. Comfort, J. U. Lee, and A. C. Diebold, *Appl. Phys. Lett.*, **2010**, *97*, 253110

2 E. D. Palik. Handbook of Optical Constants of Solids; Academic: New York, 1985.