Graphene effect on metallic plasmon resonances

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In this contribution the effect of thin layer graphene on different symmetric and non-symmetric plasmonic structures of silver is simulated. Graphene as a protective layer over silver makes a better sensing structure overcoming the silver instability limitations as well as exploiting the advantages of high sensitivity of silver based plasmonic sensors. Our simulation results confirm that long range cavity plasmon resonance (LRCPR) sensor outperforms traditional cavity plasmon resonance in sensitivity [1]. High intensity of electric field inside the cavity makes it a potential candidate for single molecule detections.

3 layer graphene cause 4 nm and 5nm nm red shift in plasmon excitation wavelength for asymmetric and symmetric CPRs, respectively. This shift for cavity plasmon modes are plotted in figure 1. In Fig. 2 the phase shift is a result of sample refractive index changes in the order of 10^{-5}.

2.3 units increase in the field intensity of Ag/graphene LRCPR (6.8) compare to pure silver CPR structures (4.5) is reported.

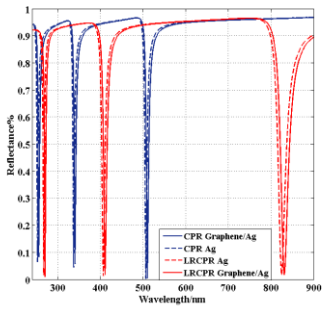

Fig 1: 3 layer graphene effect on CP resonance wavelength

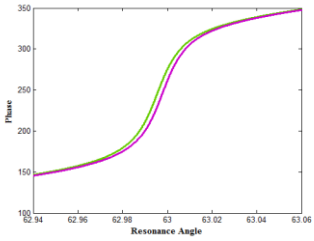

Fig. 2. Resonance angle shift for LRCPR Ag/Graphene

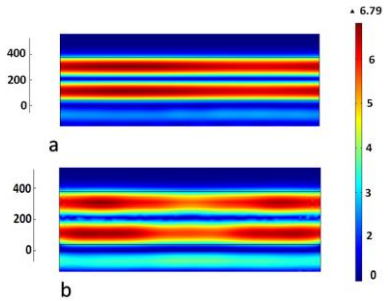

Fig 3. Field enhancement of cavity plasmon resonance for a) Ag LRCPR, b) Graphene/Ag LRCPR

References

1. D. Razansky, P. D. Einziger, D. Adam, IEEE Trans. on Nanotech., **7**, (2008)
2. O. Salihoglu,S. Balci, C. Kocabas, App. Phy. Lett., **100**,(2012)