Optical Spectra of Helical Gold Nanorods: Emergence of the Plasmon Resonance

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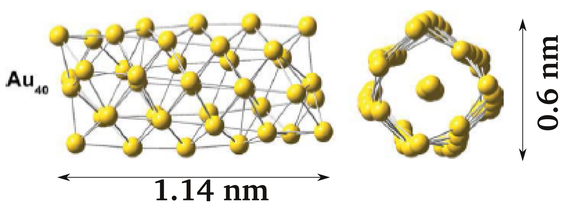
Background

Au_{24}, Au_{40}, and Au_{56} helical gold nanorods have been shown to be energetically stable[1]. Although they have enough electrons to theoretically support plasmon behaviour [2 their length is on the border of being too short[3]. Because they are helical any plasmonic behaviour is likely to be novel.

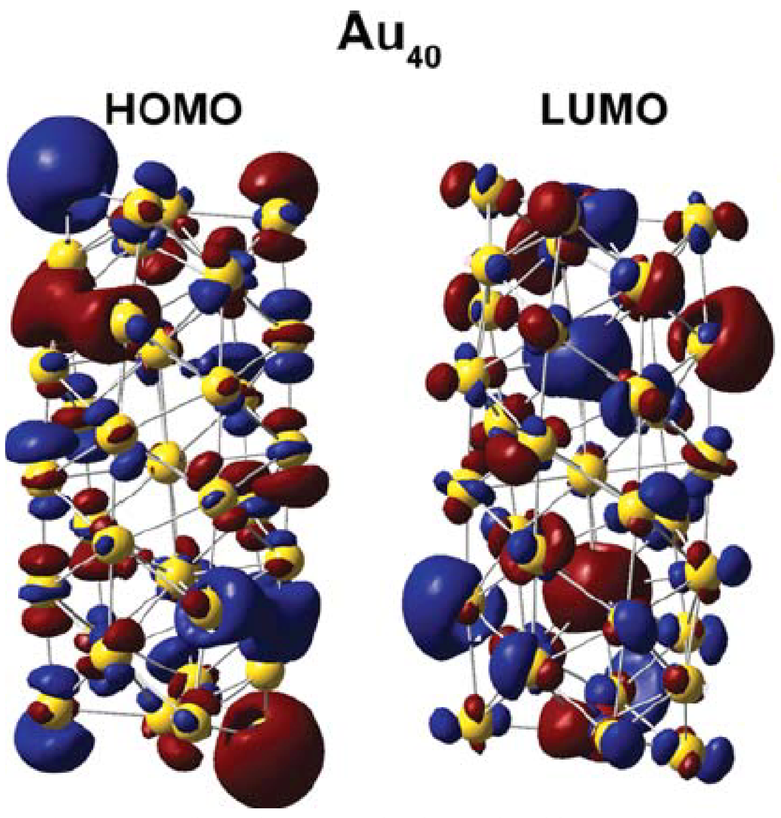


Methods

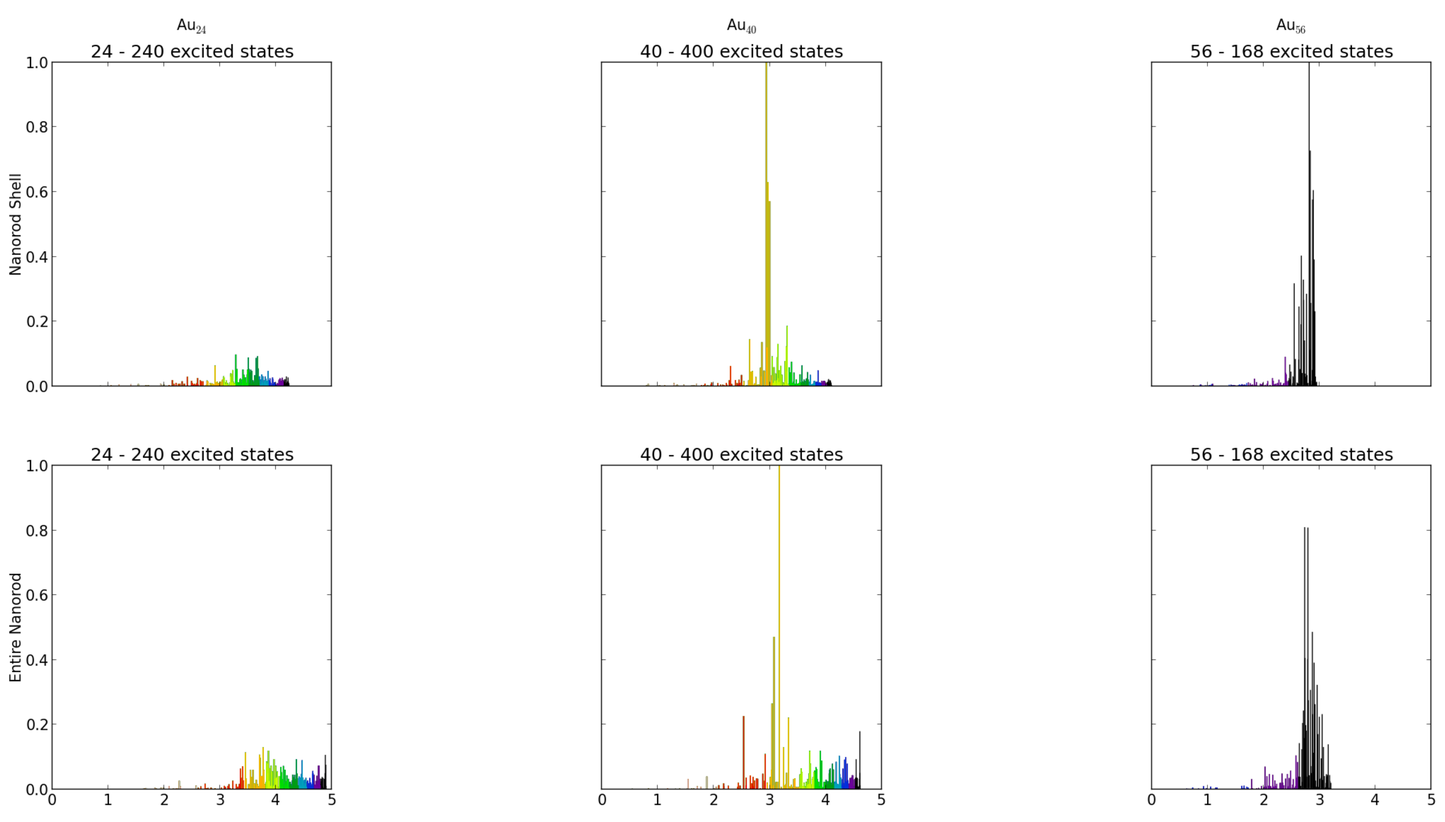
We used TD-DFT as implemented by Gaussian 09 with the lanl2dz [1] basis set and the long range corrected wPBE [5] functional to calculate the Absorbance spectra of the nanorods.

Conclusions / Future Work

A longitudinal plasmon mode appears to be emerging as seen by the red shift in the maximum absorbance peak going from Au_{24} to Au_{56}. Extending the current calculations will help determine if there is a transverse mode at higher energies. Calculating the CD spectra and solving Maxwell's equations for these nanostructures will complement the quantum calculations.



Results



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