

Homework Nano-scale Engineering #2, Due Date October 16, 2008

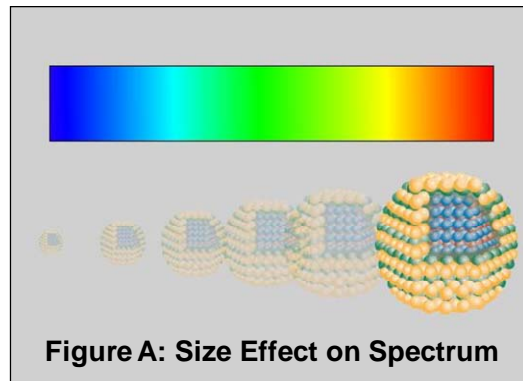
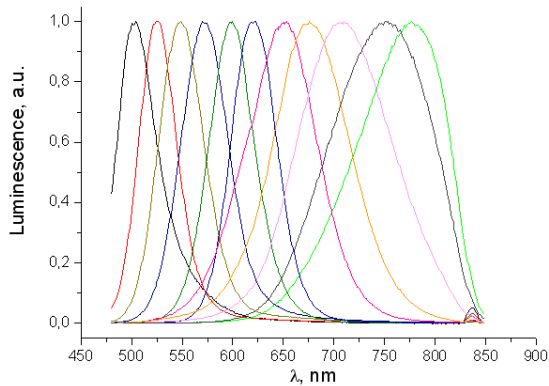
1. Visit and critically review the carbon nanotube information in the following website: <http://www.pa.msu.edu/cmp/csc/nanotube.html> .

Briefly answer the following questions with no more than one sentence each (5 points)

- About how many times stronger than steel is a carbon nanotube?
- Can a nanotube be metallic, semiconducting, or both? Why?
- Carbon nanotubes exhibit a number of different quantum effects. Briefly describe one observed phenomenon.

1.) (a) $\sim 100 \times$, but there is much variation
 (b.) Either semiconducting or metallic ,
 due to bond structure.
 (c) Electrical transport phenomena

2. Visit http://en.wikipedia.org/wiki/Quantum_dot and understand quantum dots. You should be able to find the figure shown below. Please use one sentence to explain the most critical parameter that affects the emission spectra (5 points).



This figure shows the fluorescence emission spectra of CdTe quantum dots of different sizes. The emission spectrum is size dependent. Nanoparticle ground state absorption

energy can be calculated by
$$\hbar\omega = E_g + \frac{\hbar^2}{2m_e^*r^2} \pi^2$$
 . It is dependent on the particle size. As shown in the figure A, the spectrum shift to red color when the particle increases.