

EE 505 – Nanostructures: Fundamentals and Applications

Fall 2011

Homework #3

Prof. Carmen S. Menoni

Due Date: October 29, by email

Midterm exam will be on November 9- It will be a take home test- assigned in the evening and due the next morning. The format will be similar to this homework.

1. (100 points) Read the paper “Colloidal InP Nanocrystals as Efficient Emitters Covering Blue to Near-Infrared” by Renguo Xie, David Battaglia, and Xiaogang Peng, J. Am. Chem. Soc., 2007, 129 (50), pp 15432–15433. Answer the following questions:
 - a. How are the nanocrystals grown?
 - b. What is the process whereby the ZnS core shell is grown? What is the role of this capping layer?
 - c. How is it ensured that ZnS and not an oxide material would form at the surface of the dot?
 - d. What type of information is available on the paper to support the presence of this capping layer?
 - e. How is size-sorting carried out? What is the range of sizes that can be obtained with their process?
 - f. Explain what Figure 1 show, and how it was obtained.
 - g. How would you model the results of figure 1?
 - h. How do the authors know they have grown InP nanocrystals and not any other colloidal material?
 - i. What are potential applications of the InP nanocrystals? Support your claims with references from papers that have shown their use.
2. (40 points) From Chapter 5 exercises
 - a. Exercise 1
 - b. Exercise 2
 - c. Exercise 3
 - d. Exercise 4
3. (points) From Chapter 6 exercises
 - a. Exercise 3
 - b. Exercise 4
 - c. Exercise 6
 - d. Exercise 8
 - e. Exercise 10