TTL 740 Science and Applications of Nanotechnology in Textiles

Major Exam

5th May 2010

8 to 10 A.M   **Max Marks 30**

Que 1. For ultrafine particles of varying sizes - 1µm, 100nm, 10nm & 1nm, calculate the percentage of surface vs bulk atoms assuming the particles to be (a) perfect spherical (b) perfect cubic shaped. Which particles should show size dependent property?

Note: Consider the given size to radius "r" for spherical particles and linear dimension "l" for cubic shaped particles. Assume interatomic spacing to be 2.5 A^o and surface region to be 10 A^o thick.   (4)

Que 2. For depositing carbon nanotubes (CNT) on a substrate in a patterned form, which of the following routes you would prefer and why?

>   PVD or CVD

Which of the two process yields purer CNTs and how?   (5)

Que 3. Which property enhancement the following nanoparticles can give when applied on textiles as a finish? (Any two)   (4X2=8)

   (a) Silica Nanoparticles
   (b) TiO_2 nanoparticles
   (c) ZnO nanorods

Discuss the most preferred synthesis and application routes and the mechanism by which they work.

Que 4. Which of the following routes you would prefer to deposit silver nanoparticles on nylon fibers / fabrics? Discuss the process and justify your choice.   (5)

>   Plasma Polymerisation or Layer-by- layer Self assembly

Que 5. Which of the following statements is correct? Justify.   (4X2=8)

   a. The dyeability properties of PP/clay nanocomposite fibers are adversely affected due to incorporation of clay.
   b. Increasing solution viscosity results in larger diameter fiber in the electrospinning process.
   c. Electrospinning would be the preferred route to prepare PP nanofibers.
   d. The density of POSS hybrid nanofiller is high as it has an inorganic Si-O core.