

Homework #2

1. How many cubes 1 nm on each side can be carved out of a cubic parent 1 m on each side? What is the surface area of nanometer-sized cube?
2. If the parent cube consisted of an fcc structure with spheres 1 nm in diameter, what would be the collective surface area of all the individual spheres?
3. Determine the surface area in terms of cm^2 of an alumina membrane (10 cm x 10 cm x 40 μm thickness) with (a) no pores (b) pore channels with diameter $d = 250$ nm, porosity 55% (c) diameter $d = 2.5$ nm porosity 55%.
4. Calculate the d-spacing for (111) planes in gold.
5. What is surface plasmon? Why do you think it is affected by the size of the materials? What are other factors that can influence the surface plasmon?
6. Using only the C-C bond distance in graphite and simple geometry, calculate the diameter, the surface area, specific surface area and the density of a single-walled carbon nanotube that has 12 hexagonals of carbon along the circumference with long axis of the hexagon oriented along the long axis of the tube.