

Solid State Physics for Nano
SS 2019
Exercise sheet 7
Magnetism

Exercise 1: dielectric polarisability

Amorphous Selenium is filled in between the two plates of a capacitor with $\epsilon = 6.0$ and a concentration of 3.67×10^{28} atoms/m³. (a) Estimate the polarizability of selenium atoms (b) estimate the local electric field at one selenium atom, (c) determine the local dipole moment of a selenium atom within the electric field, (d) how large must be the dielectric constant in order to create a local field by similar amount as the macroscopic field ?

Exercise 2: plasmon frequency

ITO is a conductive material with high transparency in visible spectral range. (a) a deposited ITO layer may have a charge carrier density of 5×10^{21} cm⁻³. Up to which wave length the layer is transparent? (hint : consider $m^* = m$ and $\epsilon(\infty) = 3.84$). (b) at which wave length the reflectivity is minimum ?