LECTURE 6

Polarizability

Topics to be covered

- Polarizability
- Susceptibility

Electric susceptibility:• The polarization vector P is proportional to the total electric flux density and direction of electric field.
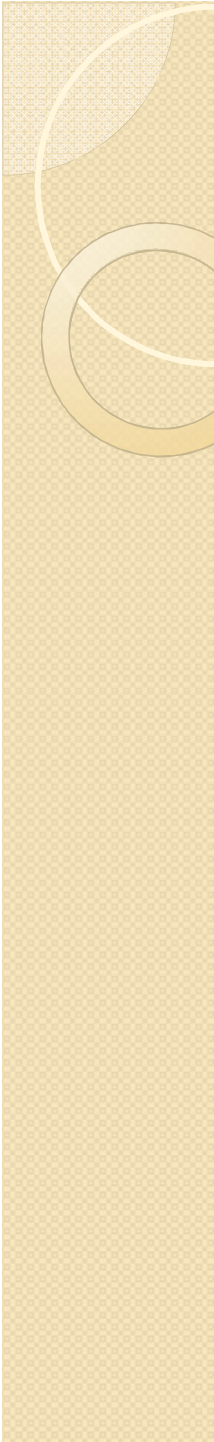
Therefore the polarization vector can be written

$$P = \varepsilon_0 \chi_e E$$

$$\chi_e = \frac{P}{\varepsilon_0 E}$$

$$= \frac{\varepsilon_0 (\varepsilon_r - 1) E}{\varepsilon_0 E}$$

$$\chi_e = \varepsilon_r - 1$$

Various polarization processes:

1. Electronic polarization
2. Ionic polarization
3. Orientation polarization
4. Space charge polarization

1) Electronic Polarization:- When an EF is applied to an atom, +vely charged nucleus displaces in the direction of field and ẽ could in opposite direction. This kind of displacement will produce an electric dipole with in the atom i.e, dipole moment is proportional to the magnitude of field strength. This displacement between electron and nucleus produces induced dipole moment & hence polarization. This is called electronic polarization. It increases with increase of volume of the atom. This kind of polarization is mostly exhibited in Monatomic gases . It occurs only at optical frequencies (1015Hz). It is independent of temperature