S.G.V.C Vidya Prasarak Trust's

M.G.V.C ARTS, COMMERCE AND SCIENCE COLLEGE MUDDEBIHAL

DEPARTMENT OF PHYSICS

Teachers Use ICT enabled tools for Effective teaching learning process

Name of the Staff Member: Annapurna Katti

Topic- Dielectrics.

Class: B.Sc.-II Semester **Date:09.05.2025** **Time: 8:30am to 9:30am**

PRINCIPAL,
M.G.V.C. Arts, Commerce & Science College
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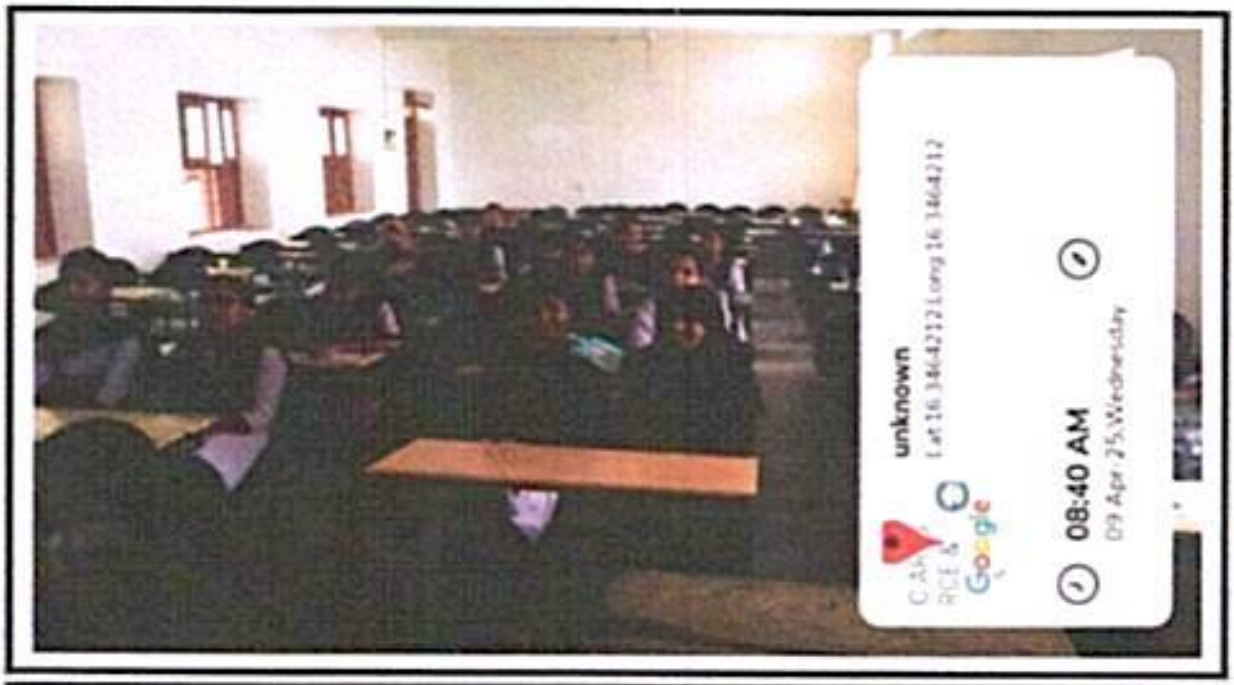


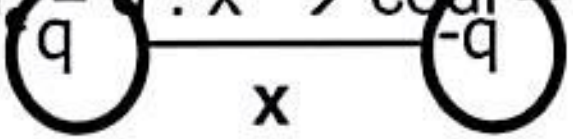
Dielectric material

Dielectrics are the materials having electric dipole moment permantly.

Dipole: A dipole is an entity in which equal positive and negative charges are separated by a small distance..

DIPOLE moment (μ_{ele}):The product of magnitude of either of the charges and separation distance b/w them is called Dipole moment.

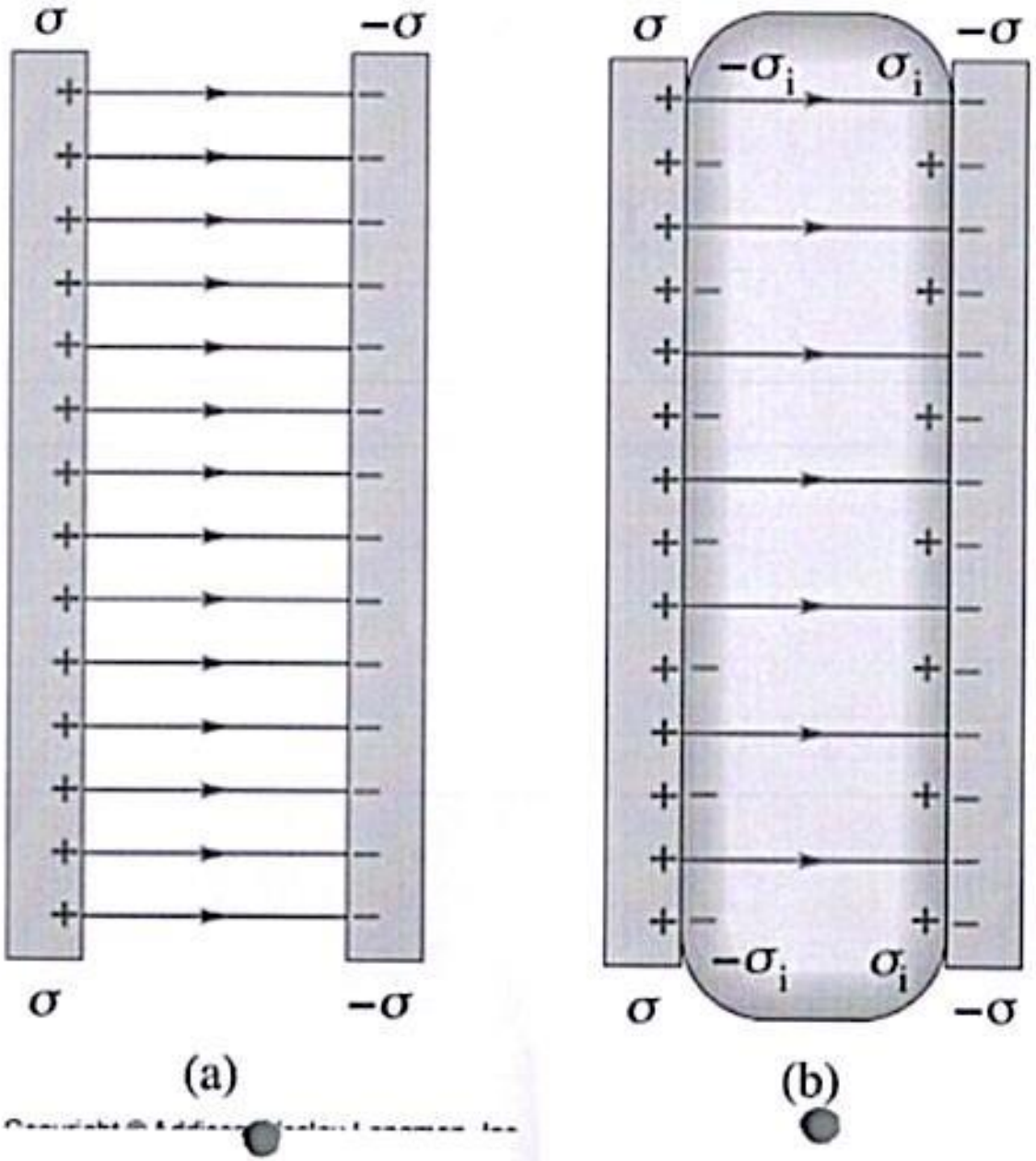
$\mu = q \cdot x \rightarrow$ coul - m



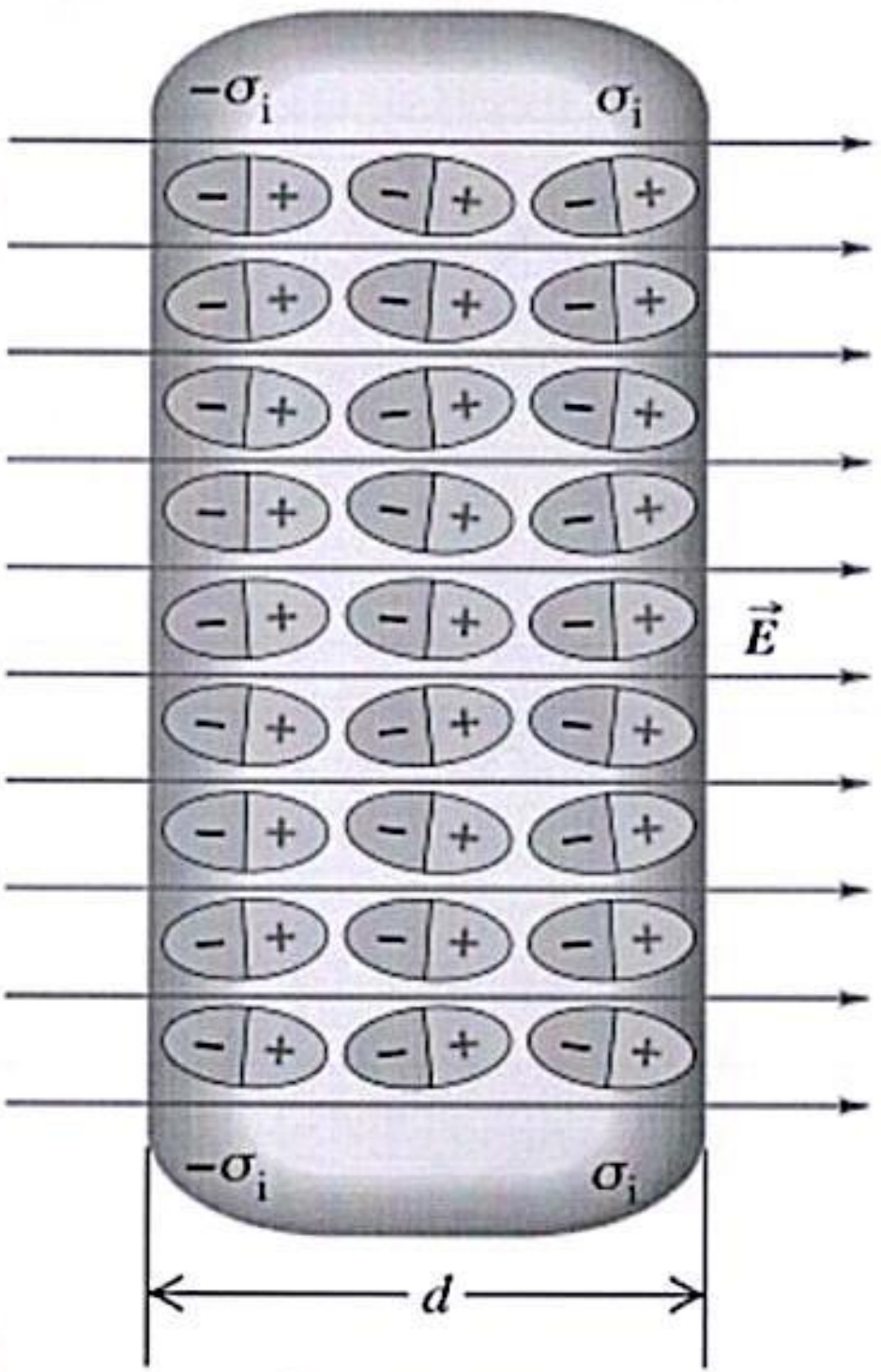
All dielectrics are electrical insulators and they are mainly used to store electrical energy.

Ex: Mica, glass, plastic, water & polar molecules

The charges induced on the surface of the dielectric (insulator) reduce the electric field.



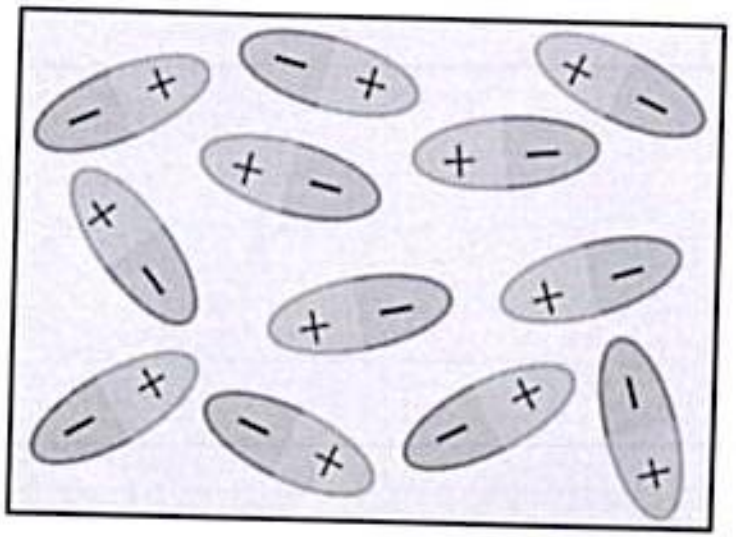
"Polarization" of a dielectric in an electric field E gives rise to thin layers of bound charges on the dielectric's surfaces, creating surface charge densities $+\sigma_i$ and $-\sigma_i$.



Atomic View of Dielectrics: The molecules of the dielectric are modeled as dipoles

No External E-Field

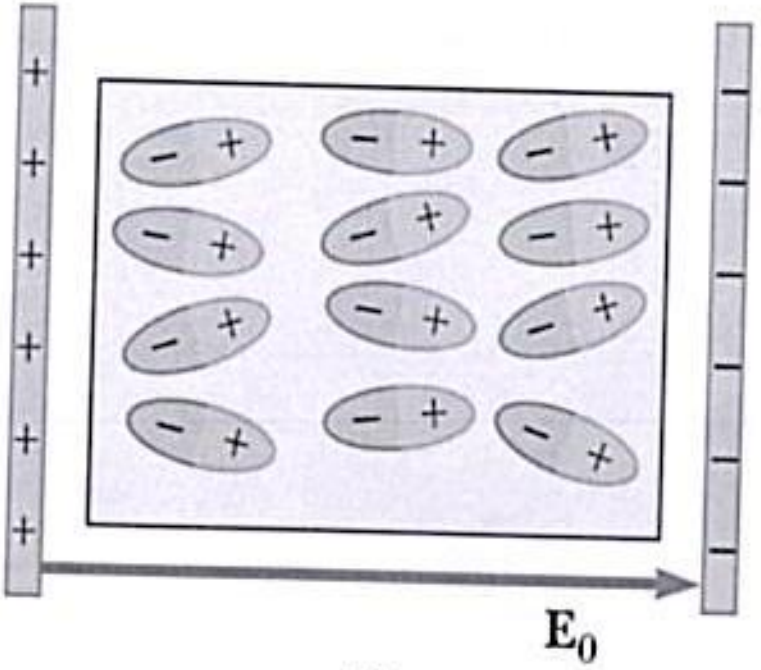
Random orientation of molecules



(a)

External E-Field

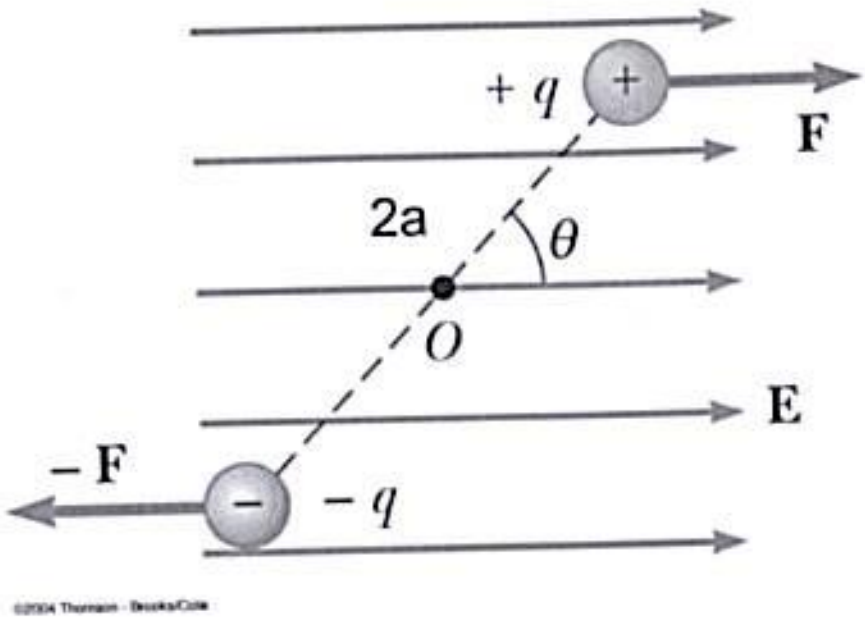
Partial Alignment of Molecules



(b)

Force Acting by a Uniform External Field on the Dipole

- **Note: E** is not the field produced by the dipole
- The force acting on each charge is
  $F = Eq$
- The net force on the dipole is **zero**
- The forces produce a net torque on the dipole



$$p=2aq$$

$$\tau = 2Fa \sin\theta = pE \sin\theta$$

$$\tau = p \times E$$