



FIGURE 1.10: Parallel plates with an insulating dielectric material

$$\varepsilon = \varepsilon_0 \times \varepsilon_r \quad \text{and} \quad \frac{Q}{V} = \frac{\varepsilon_0 \varepsilon_r A}{d}$$

The *dielectric strength* of an insulating dielectric is the maximum electric field strength that can safely be applied to it before breakdown (conduction) occurs. Table 1.6 shows values of relative permittivity and dielectric strength for some common dielectric materials.

Table 1.6: Properties of some common insulating dielectric materials

Dielectric material	Relative permittivity (free space = 1)	Dielectric strength (kV/mm)
Vacuum, or free space	1	∞
Air	1	3
Polythene	2.3	50
Paper	2.5 to 3.5	14
Polystyrene	2.5	25
Mica	4 to 7	160
Pyrex glass	4.5	13
Glass ceramic	5.9	40
Polyester	3.0 to 3.4	18
Porcelain	6.5	4
Titanium dioxide	100	6
Ceramics	5 to 1,000	2 to 10