Material Testing: Electrical & Physical
CH- 4057 BASEL

HUNTSMAN

Determination of the Relative Permittivity and Dielectric Dissipation Factor of Electrical Insulating Materials

Definition: The relative Permitivity of a material is the relation between the capacity C_x of a capacitor which is filled with the material in question and the capacity C_0 of the same capacitor when vacuum is the dielectric.

$$e_r = \frac{C_x}{C_0} \qquad e = e_r \cdot e_0 \qquad e_0 = 8.854 \cdot 10^{-12}\, Fm^{-1}$$

The dielectric loss angle δ is the angle by which the phase difference between applied voltage and resulting current deviates from 90° when the dielectric of the capacitor consists exclusively of the insulating material. The dielectric dissipation factor is the tangent of the loss angle δ.

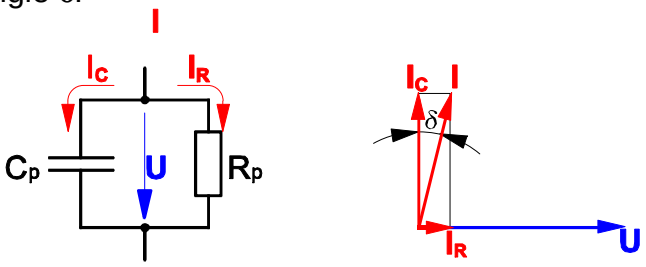
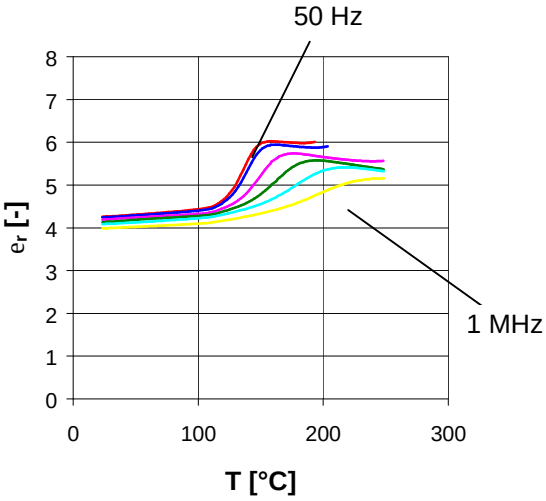


Figure 1: Equivalent parallel circuit and vector-diagram

Permitivity and tan δ are both influenced by temperature and frequency.

Typical graphs of SiO_2-filled polymers:



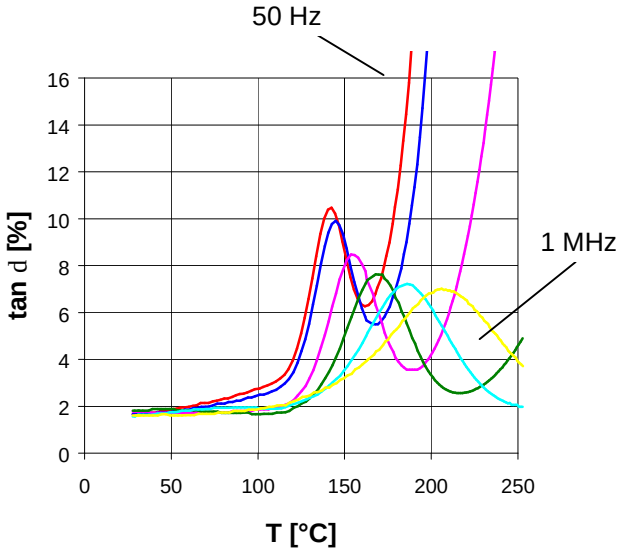


Figure 2 : ε_r and tan δ shown as function of temperature and frequency